ROADS and STREETS

HIGHWAYS • BRIDGES • AIR FIELDS • HEAVY CONSTR

Gillette Publishing Co., 22 West Maple St.
Chicago 10, Illinois

MARCH 1956

Dozer-Fed Loader Works Big Cut

New Research in Equipment Utilization

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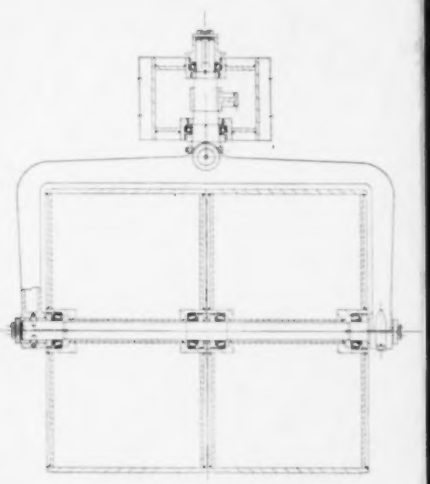
Accepted as Controlled Circulation Publication at Cedar Rapids, Iowa



How **THE GALION IRON WORKS & MFG. COMPANY** mounts the axle and steering column on Timken tapered roller bearings for less friction, longer life.

dry up and blow away!

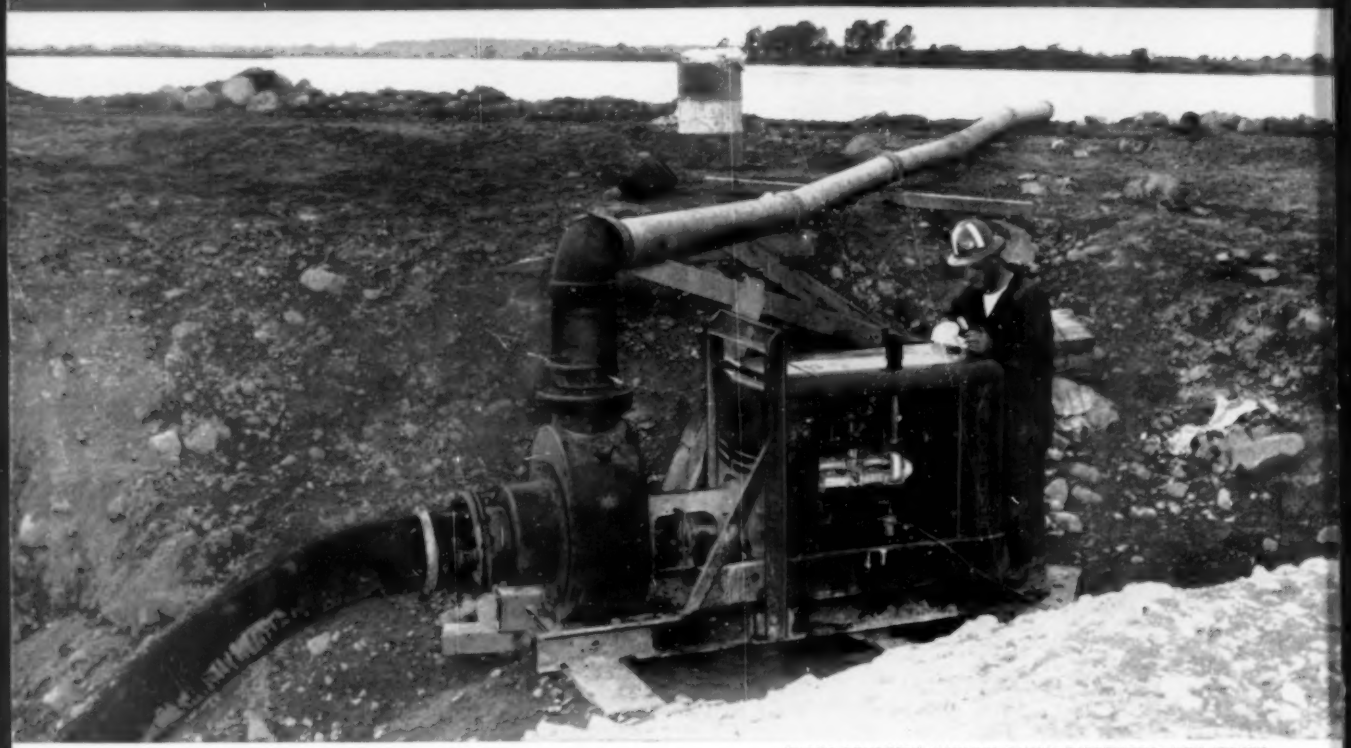


PHOTO COURTESY MARLOW PUMPS, RIDGEWOOD, NEW JERSEY

Chrysler-powered pumps de-water 1¾ mile long area for blasting rocks from St. Lawrence Seaway

Blast those rocks! And that's exactly what they're going to do at Ogdensburg, New York. But since the rocks are at the bottom of the St. Lawrence River, the area must first be "dried up" to permit blasting.

It isn't an easy job, but it's a vital one. Rocks *must* be dynamited out of their centuries-old resting places if the St. Lawrence Seaway Project is to proceed as scheduled. Giant cofferdams, extending from offshore islands to the mainland, have been built, and to date more than 400 million gallons of water have been removed from the area.

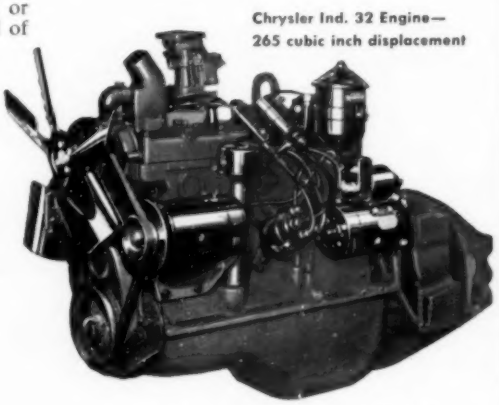
In the performance of this remarkable feat, three Marlow 1061 self-priming centrifugal pumps have been operating around the clock for thirty days, never stopping. The Chrysler Ind. 32 Engine powering each pump is fueled while running. The pumps are delivering about 2500 gallons per minute, running at a speed of 1450 RPM, with a suction lift of twenty feet and a discharge head of twenty-five feet. Engineers working at the site report excellent performance from pumps and power with no trouble whatsoever.

Whether your equipment is to perform on a continuous, intermittent or stand-by basis, you'll want the kind of heavy-duty performance you get from Chrysler *high-speed* industrial engines. From 230 to 331 cubic inch displacement, each Chrysler In-line 6 or V-8 Industrial Engine is engineered, equipped and built for heavy-duty service. Yet each is a *modern* engine, lightweight and small enough to fit practically any construction equipment.

See a Chrysler Industrial Engine Dealer, or write direct to factory. Ask about optional equipment, too.

Dept. 103, Industrial Engine Division, Chrysler Corporation, Trenton, Michigan.

Chrysler Ind. 32 Engine—
265 cubic inch displacement



HORSEPOWER WITH A PEDIGREE

Chrysler

INDUSTRIAL ENGINES

Industrial Engine Division • Chrysler Corporation

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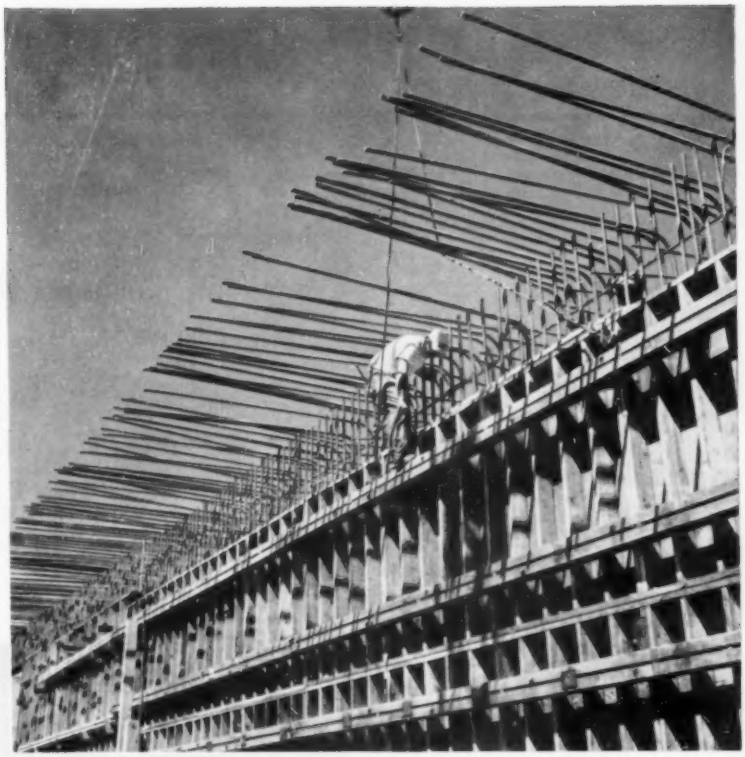
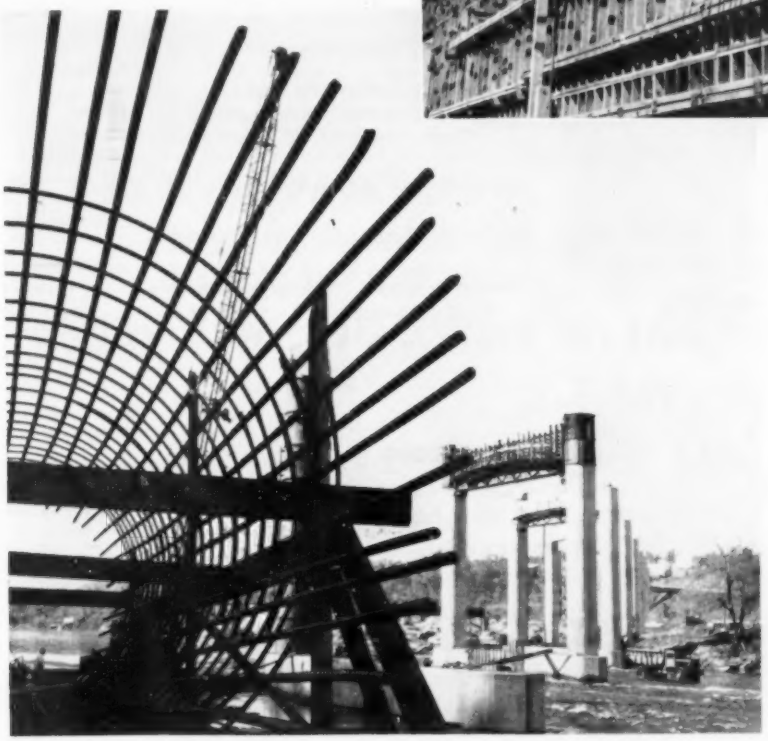
Fabricated Bars for Two Major Turnpikes



Constructing one of the overpasses along the Massachusetts Turnpike at Weston. *General Contractor:* B. Perini & Sons, Inc., of Framingham, Massachusetts.

A new bridge crossing the Lehigh River near Lehighton is one of the major structures along the Pennsylvania Turnpike's Northeast Extension. *General Contractor:* Brayman Construction Co., Pittsburgh.



Two of the biggest highway projects in the East are the Pennsylvania Turnpike's Northeast Extension and the Massachusetts Turnpike.

In Pennsylvania, the new 110-mile extension will link Philadelphia's port and industrial facilities with the anthracite coal regions to the north.

In Massachusetts, the cross-state Turnpike will connect Boston with the western border, eventually linking with the New York State Thruway.

For both these important highways Bethlehem is supplying substantial tonnages of fabricated reinforcing bars for bridges, underpasses and overpasses, and other concrete construction.

Bethlehem bars are made exclusively from new-billet steel of known analysis. They come in size ranges from Numbers 3 to 11, with deformations meeting ASTM Spec. A-305. They are cut to length and bent in our shops, and reach the job bundled and tagged, with bar lists included, ready for instant placing.

TEN BAR FABRICATING SHOPS AT YOUR SERVICE

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BETHLEHEM STEEL

BETHLEHEM REINFORCING BARS

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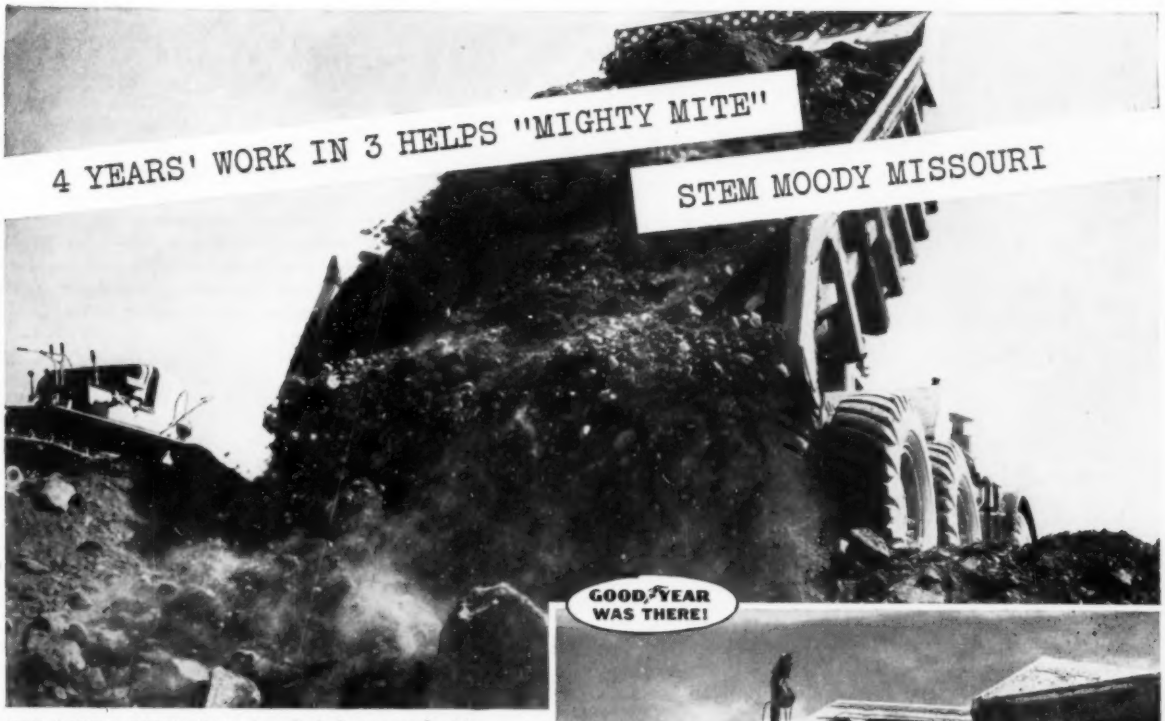

THE GAVINS POINT DAM is a "mite" compared with its giant fellow dams of the vast Missouri Basin Development Program. But Gavins' 8,700-foot crest length and 800-foot base-width make it a MIGHTY mite. After a flooded-out start, 2 million yards were moved in a record comeback and classic 8-day closure, spearheaded by end-dumps as shown above. The tires are Hard Rock Lugs by Goodyear.

LATEST IN TIRE-MAINTENANCE TRUCKS helps keep big fleet of earth-movers rolling.

Mighty fine cost-cutters on tough construction jobs—

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Goodyear Job-Proved Tires

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In 2 years' rugged service on the toughest, fastest-stepping jobs, Goodyear's exclusive 3-T NYLON CORD has proved itself the greatest tire SAVER in 21 years! It keeps bruise-breaks and heat blowouts close to the vanishing point, virtually eliminates ply separation and flex failure—keeps tires in shape for many more re-lugs and recaps. If you want the most durable cord, plus the best in tire design, plus the toughest rubber compounds, specify Goodyear 3-T NYLON CORD Tires for every wheel on every job! Goodyear, Truck Tire Dept., Akron 16, Ohio

FOR EACH JOB, THERE'S A COST-CUTTING GOODYEAR TIRE BUILT WITH 3-T NYLON CORD

Buy and Specify

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Road Lug, All-Weather, Sure-Grip—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

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ROADS AND STREETS

Devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations; the construction and maintenance of airports. Represents 63 years of continuous publishing in the highway field; combined with Engineering and Contracting and Good Roads Magazines, established in 1892.

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HOW THE CAT* No. 12 MOTOR GRADER HELPED CUT COSTS

on the Garden State Parkway

Last year New Jersey's fine four-lane Garden State Parkway went in from Cape May to Paramus. Along one section of this big job the haul roads ran a mile and a half from borrow pit to fill—and the fill was 100% sand. It took continuous grading to keep the fill compacted, and Public Constructors, Inc., of Pleasantville, N. J., relied on four Cat No. 12 Motor Graders to do the job, as well as to keep the haul roads in shape.

"What would a contractor do without Caterpillar when there's an earthmoving job to be done?" wonders Supt. John W. Franks. Mr. Franks likes lots of things about the No. 12—mostly its low-cost features. And the *new improved* No. 12 offers greater low-cost advantages than ever.

Costs less to maintain. There's extra life built into every part of the Cat No. 12. The new exclusive Caterpillar Oil Clutch, for example, practically eliminates disc replacement and reduces down time considerably.

Costs less to operate. Just one reason among many: the heavy-duty 115 HP engine delivers efficient power on low-cost non-premium fuels.

. . . for more details circle 200, page 16

Produces more. Positive controls; easy, natural steering that maintains "feel of the road"; clear visibility; fast, accurate blade positioning—features like these add up to maximum operator comfort and convenience, higher production on any job.

AND NOW, ANOTHER NEW COST-SAVING FEATURE:
New tubeless tires do away with expensive tube and flap trouble, eliminate costly tube replacement and can cut over-all tire down time *by 80%!*

No wonder Supt. Franks says, "To us, Caterpillar is the old reliable, always out in front with new designs that assure you not only the latest, but the best."

See *your* Caterpillar Dealer for full details on the high-producing, cost-cutting Cat No. 12 Motor Grader. There's nothing else like it available—anywhere.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

99% OF ALL CAT MOTOR GRADERS EVER BUILT ARE STILL AT WORK

TUNE IN:
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starring
JIMMY DURANTE
on TV Saturday nights.
METROPOLITAN OPERA
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Saturday afternoons.

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Get extra work from engines ...at no extra cost

It's no secret that an engine lubricated with one of the famous *Texaco Ursa Oils* delivers *more power* with *less fuel* over *longer periods* between scheduled overhauls. The reason why—

Texaco Ursa Oils, especially designed for use in diesel and heavy duty gasoline engines, embody powerful detergent and dispersive properties that keep engines clean... assure free rings, proper valve seating, full compression and complete combustion.

For air compressors and hydraulic mechanisms, use *Texaco Regal Oil R&O*—it keeps compressor systems clean; prevents rust, sludge and foam in hydraulic systems. And to assure longer drill life, use *Texaco Rock Drill Lubricant EP.*

A Texaco Lubrication Engineer will gladly help you simplify your lubrication, step up efficiency and save money throughout your operation. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, New York.

TEXACO SIMPLIFIED LUBRICATION PLAN:
You need *only six* Texaco Lubricants to handle *all* major lubrication. Cut lubricant inventory, avoid confusion and mistakes, save time and money. Full details from your Texaco Lubrication Engineer.

Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT

. . . for more details circle 265, page 16

Allis-Chalmers Scraper and Tractor Fleet Moves Four and a half Million Cubic Yards of California Hills

Four HD-16 tractors with 20-cu. yd. Allis-Chalmers scrapers level a hill to make a large fill. Torque converter drive helps units return uphill fast for next load . . . cut valuable time from every cycle.

Motor Scrapers and HD-21's and HD-16's with pull-type scrapers level steep grades on Millbrae housing project near San Francisco

In leveling 50 acres of rugged California hills to complete its Millbrae housing project just south of San Francisco, Trousdale Construction Co. is moving 4½ million cubic yards of earth—with over a million cubic yards to be placed on a single fill.

To handle the job, Trousdale called on Tecon Construction Co. of Dallas, Texas. Tecon called on its fleet of Allis-Chalmers torque converter drive crawler tractors—six HD-21's and six HD-16's. In addition, Tecon brought in a fleet of Allis-Chalmers pull-type and motor scrapers to do the dirt hauling.

On this big project, the HD-21's and HD-16's are overcoming steep grades and stubborn hills. One reason: torque converter drive which makes full use of maximum engine horsepower . . . automatically matches tractor speed and pull to load and terrain conditions . . . provides outstanding operating ease . . . eliminates engine stalling and most shifting, reduces shock and strains to power train.

Allis-Chalmers motor scraper climbs steep grade for another load. Hill in background is just one of many being leveled by Tecon Construction Co.'s fleet.

Output-producing HD-16's put a big load into this scraper. Wide, low bowl design and offset cutting edge help Allis-Chalmers scrapers get heaping, void-free loads . . . cut cost and time per yard.

Never an idle moment for Allis-Chalmers tractors—when not push-loading they are busy dozing. An HD-21, right rear, compacts earth with a sheeps'-foot roller.

Other reasons: Allis-Chalmers diesel engine design causes exploding fuel to exert follow-through push on the pistons . . . provides maximum leverage when crankshaft is at most favorable angle . . . eliminates combustion knock, gives complete, clean combustion and more usable power per drop of fuel.

As the going gets tougher on this job, other HD-21 and HD-16 advanced design features show their superiority: all-steel box-A main frame, 1,000-hr lubrication, straddle-mounted final drives, Tru-Dimension machined and hardened track—all help these big tractors deliver the goods in output, dependability and service simplicity. Let your Allis-Chalmers dealer prove it!

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

. . . for more details circle 180, page 16

WEIGHT CLASS! CHEVROLET

New Chevrolet trucks for '56 bring you new heavies, middleweights and lightweights in eight great new series—new power and performance to save more money on your hauling job!

New Heavyweights—New Tandems! All-new heavyweights in 9 wheelbases, with maximum G.V.W. ratings up to a new high of 32,000 lbs.; G.C.W. up to 50,000 lbs.

Ultra-Modern Features! Tubeless tires, standard; High-Level ventilation and panoramic visibility; plus Concealed Safety Steps on most models.

Wider Range of Drives! There's an automatic drive in every series with new Powermatic for most middleweights and heavies; Hydra-Matic for light-duty models. Both extra-cost options. A new 5-speed transmission is standard in 9000 and 10000 series models; optional at extra cost in other heavies and most medium-duty models. New heavy-duty 5-speed is an extra-cost option in models with new Loadmaster V8.

A Modern V8 for Every Model! And introducing the completely new 322-cu.-in. Loadmaster V8, standard in new 9000 and 10000 series heavyweight models.

See Your Chevrolet Dealer and his new Task-Force line before you buy. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

TASK·FORCE TRUCKS

. . . for more details circle 217, page 16

"Most versatile units we've ever used!"

says Roland L. Bowen, A. Bentley & Sons, Toledo, Ohio

Gar Wood's exclusive Foundation Borer attachment has cut footing costs on many Bentley jobs. Machine bores a clean round hole, then bells hole at the bottom. Digs up to 26 unreinforced footings per day. Fast, positive hydraulic control. Completely convertible.

Four Gar Wood "75" excavators, two on crawlers and two on truck chassis, handle a wide range of applications more profitably for this leading contractor. Roland Bowen, master mechanic for the firm, says, "We've worked our 75's on bridges, tunnels, caissons, powerhouse and factories—and we've found them the most versatile, most satisfactory units we've ever used. Equipped with the foundation borer attachment, our 75's are used to drill for caissons . . . with the dragline to excavate for drainage. And, they're easily converted for steel erection."

Servicing is simple, too. "No special tools or presses are required," reports Bowen. "Since all shafts are splined, we can handle occasional repairs quickly in our own shop. Our repair bills have been practically nothing!"

Gar Wood "75's" deliver this kind of low-cost, dependable workability because they're built by specialists in ¾ yard machines. Find out for yourself how this specialization can pay off in more profit on your next job. Call your Gar Wood dealer or write: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

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Plants in Wayne and Ypsilanti, Mich.; Findlay, Ohio; Mattoon, Ill.; Richmond, Calif.

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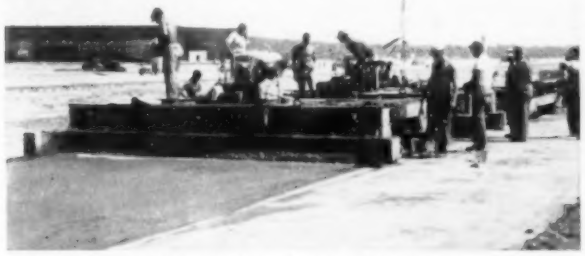
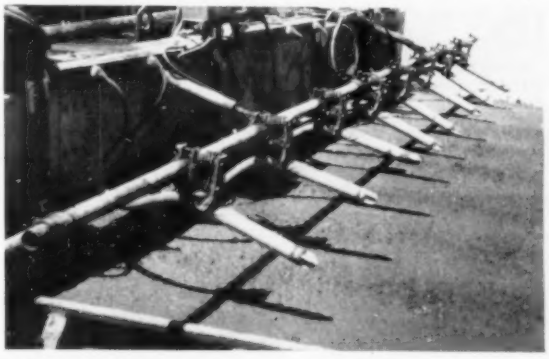
WITH 3 PAVERS WORKING, one Jaeger spreader-finisher "team" completed 5400 lin. ft. of 20 ft. slab in one 20-hour day.



THESE TWO JAEGER-LAKEWOOD FINISHERS and a Koehring longitudinal float followed a Jaeger screw spreader. Adjacent slab surface had been cleaned with a blade.



BOTH SPREADERS were equipped for deep vibration.

7400 feet of 14" x 20' concrete slab . . .

one day's production with 2 Jaeger paving "teams"

1½ MILLION sq. yds. of slab 13" and 14" thick is a lot of concrete paving. To produce, place and finish it at the new Plattsburg, N. Y. Air Force Base, the two contractors operated 5 pavers and 2 Jaeger paving teams. Each "team" consisted of a Jaeger screw spreader with vibratory equipment and 2 Jaeger-Lakewood finishers, followed by the usual floats. The mix was 1½" slump, increased to 2" in hottest weather.

On the Winkelman-Tomkins-Jones joint venture contract, requiring 387,600 cu. yds. of concrete, 2 shifts per day were worked with 3 pavers ahead of a Jaeger spreader-finisher "team". An additional paver and duplicate finishing equipment were kept on hand to maintain paving continuity during lane changes. Daily production was from 3500 up to 5400 lineal ft. of 20' slab, 14" thick. Bero Construction Corp.'s contract (165,000 cu. yds.) was handled in 10-hour single shifts with 2 pavers ahead of a Jaeger "team". In spite of difficulty in hauling materials to pavers over sand, daily production reached as high as 2000 lin. ft. (200 ft. per hour).

• **For full information** on Jaeger concrete spreaders and finishers, or aggregate spreaders, ask your Jaeger distributor or write us for catalog.

THE JAEGER MACHINE COMPANY

223 Dublin Avenue, Columbus 16, Ohio

AIR COMPRESSORS • PUMPS • CONCRETE MIXERS • TRUCK MIXERS • LOADERS

. . . for more details circle 231, page 16

WHAT'S NEW in Equipment and Materials

Stabilizing Attachment for Shoulder Stabilization

A new 4-ft. stabilizing attachment for use in widening roads and building all-weather road shoulders has been announced by Seaman-Andwall Corporation, 291 North 25th St., Milwaukee, Wis. Designed for mounting on the Seaman Pulvi-Mixer and Trav-L-Plant, the new unit is complete with rotor, torque and mixing chamber. Capable of 4 ft. mixing width, it can be installed in less than 30 minutes in place of the standard 7-ft. rotor on each Pulvi-Mixer. Requires only removal of eight bolts.

The new 4 ft. Seaman mixer was developed especially to meet the increased demand for shoulder stabilization equipment. Available as a complete package, the unit is capable of mixing fine and coarse aggregates, sand and native soils, uniformly to a depth of up to 10 in.

For more information circle 101 on Service Coupon this page and mail now.

35-Ton Truck Crane

A new 35-ton truck crane, announced by Marion Power Shovel Co., Marion, Ohio, is stated to have exceptional performance characteristics for many different types of crane work.

A few of the features are: Dual front axles, for best weight distribution; Power-removable counterweight, for easy preparation of the machine for highway travel; 180-in. wheelbase — for greater maneuverability in traffic and on the job; the full power, operational flexibility and positive air control that have proved so popular in the crawler-mounted 43-M; and a machine which will carry its maximum rated load, with outriggers, at radius of 15 ft.

For more information circle 102 on Service Coupon this page and mail now.

Welding Machine for Construction Field

A portable welding machine designed specifically for manganese steel and hard-facing work on irregularly-shaped parts has been made available by the Amsco Division of American Brake Shoe Co. Production models of the new "MF" welder have already completed thousands of hours of service at such duties as helping to maintain off-the-road construction equipment for the Massachusetts Throughway and the St. Lawrence Seaway.

As an accessory in the field of hard-facing, the MF serves as a semi automatic device for feeding flux-coated welding wire to parts of machines, or implements, being "re-treaded" with new metal after original surfaces have worn away. Unique feature claimed for the new welder include the self-feeding mechanism for keeping the welding arc constantly supplied with welding wire, at a rate exactly and instantly proportional to the size of the arc. Also described as special to the MF is the conical "hopper" mounted directly above the welding wire outlet as a means of storing and feeding flux. The flux adheres to the wire by the magnetic field created by welding current, and each one-quart refill from the hopper serves for 15 minutes of welding.

For more information circle 103 on Service Coupon this page and mail now.

Portable Rotary Compressor

With the addition of a new 210 cfm portable rotary compressor, Worthington Corporation's Portable Compressor and Contractors' Tool Division, Harrison, N. J. has announced the availability of a complete new line of modernized Blue Brute Compressors which include the 125, 210, 315 and 600 cfm sizes.

The new 210 cfm compressor incorporates the same basic features and engineering advancements as the company's other units. For example, a newly designed clutch, and separate oil reservoir equipped with a pre-heater, combine to assure immediate cold weather starting.

More equipment news page 120

General maintenance and inspection of parts have been simplified by easy accessibility features, and a gravity-draining design of the cylinders prevents "lock" and the danger of oil accumulation.

The 210 cfm Blue Brute machine is a small size, lightweight unit with extremely high and rugged operating efficiency.

All types of standard mounting are available in all the Blue Brute sizes.

For more information circle 104 on Service Coupon this page and mail now.

Improvements in Clamshell Buckets

Several improvements in its line of clamshell buckets have been announced by George Haiss Mfg. Co., Inc., 350 Fifth Ave., New York 1, N. Y., subsidiary of Pettibone Mulliken Corp., Chicago, Ill.

These changes have affected the ⅝ yd. and ¾ yd. HiPower digging buckets. These buckets now feature oversize diameter centershaft; extra heavy double-ribbed blade arms; sturdy reinforcements welded to side and back plates; heavy duty connecting arms. All buckets are drilled for side cutter attachments. All improvements are furnished as standard without any increase in price.

For more information circle 105 on Service Coupon this page and mail now.

For more items . . . see page 120

MAIL THIS COUPON TODAY!

ROADS & STREETS
22 West Maple Street
Chicago 10, Illinois

CIRCLE THE NUMBERS AND MAIL NOW!

Please send me further information on products and materials mentioned in the March Roads & Streets as circled below

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Name_____ Title_____

Firm or Gov't. Dept._____

Street_____

City_____ State_____ 3-56

NOT GOOD AFTER APRIL 15, 1956

A READER SERVICE FOR YOUR NEEDS

How to beat a fleet of limited-duty rigs

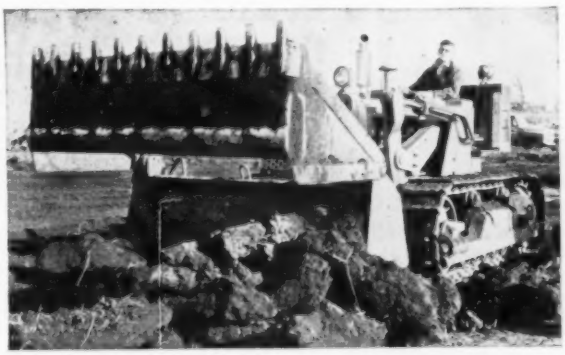
. . . WITH ONE

International® Drott 4-IN-1

Beat a power shovel wherever exclusive Drott *triple-power, pry-action break-out* is decisive—and where quick International crawler mobility can outspeed and "out-reach" a boom. Break-out force of the three Four-In-One models as Skid-Shovels ranges from 8,500 to 17,000 lbs!

Gain a 30-inch (or greater) dumping height advantage over ordinary roll-forward bucket dumping—by using the bottom-dump feature of the Four-In-One as a clamshell. And loading with the clamshell action, get a super-fast bucket-fill on stockpiled materials, even in cramped quarters.

Get versatile carry-type scraper action with the Four-In-One in Bullclam position. Using positive clam lip control, spread materials, strip, and grade with amazing accuracy. And as a Bullclam, the Four-In-One *heap-loads* itself with speedy, earth-boiling action!



Get big dozing capacity with finger-tip ease with your Four-In-One in bulldozer position. Regulate dozing depth by hydraulic "radius control" of blade pitch. Note the frost-breaking, earth-moving action. Shown here is new 2¼-yard Four-In-One for the International TD-14.

Prove Four-In-One versatility unlimited with the 1-yard TD-6, the 1½-yard TD-9, or the new 2¼-yard TD-14 model. Test *exclusive* pry-over-shoe break-out action, and *exclusive* shock-swallowing Hydro-Spring. Ask your International Drott distributor for a Four-In-One demonstration.

International Harvester Company, Chicago 1, Illinois

INTERNATIONAL® DROTT

. . . for more details circle 228, page 16

"We dig between 175 and 200 basements a year, so I sure like this new 2¼-yd Allis-Chalmers HD-11G.

It handles just like a kitten"

George Pfeiffer, *Crystal Lake, Illinois*

Excavating basements, loading out trucks and landscaping work keep George Pfeiffer busy the year 'round. Like all contractors, big or small, he tries to make every hour count.

"I like everything about our 11G, including its over-all speed and reach. We can heap big truck loads fast and easy.

"When we bought this Allis-Chalmers HD-11G, we didn't figure on using it in close around homes, but we've found that it handles just like a kitten. It responds so quickly that we're using it just like our 1-yd Allis-Chalmers tractor shovel."

• • •

To get high production on fast-moving job assignments, at a profit, more and more contractors are choosing the new HD-11G. It's a truly modern tractor shovel, with all the advantages of Allis-Chalmers advanced basic design, including an all-steel box-A main frame; one-piece steering clutch and final drive assembly; 24-volt direct electric starting; unit construction; and 1,000-hour lubrication intervals for truck wheels, support rollers and final drives.

What's more, the HD-11G has what it takes for big, tough jobs — 105 net engine horsepower; 2¼-yd bucket capacity; 11-ft, 7-in. dumping height; 32,000 lb of balanced weight; almost 9 ft of track on the ground; 8 heavy-duty truck wheels per side; long-wearing ceramic master clutch lining; and a constant mesh transmission that eliminates double shifting.

All in all, the Allis-Chalmers HD-11G is tops as a tractor shovel. Let your Allis-Chalmers dealer prove it to you in a demonstration. It will be well worth your while.

ALLIS-CHALMERS
CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

. . . for more details circle 179, page 16

ROADS AND STREETS
Sixty-Three Years of Editorial Leadership

Washington News Letter

By Duane L. Cronk

March 10, 1956

The national highway construction program has leaped the first big hurdle in its second try to make the long run through Congress.

Brushing aside the objections of opposition and cheered by support from many quarters, the House Ways and Means Committee late in February agreed to major provisions for a constructive bill for pay-as-you-go financing of a $34.8 billion federal contribution to road building.

Washington observers are cautiously optimistic about the chances for adoption of this measure by the full House. Its major provisions were almost unchanged from those submitted by Congressman Boggs, Democratic chairman of the Committee:

- An increase in the federal gasoline and diesel fuel taxes from 2¢ to 3¢ per gallon.
- An increase in the excise tax on tires, regardless of size, from 5¢ per pound to 8¢ per pound.
- An increase in the excise tax on new trucks, truck-trailers, and buses from 8% to 10%.
- A new tax of 3¢ per pound on retread rubber.

(New tires for roadbuilding equipment and rubber used for retreading off-road equipment tires would be exempt from the new 3¢ tax.)

* * *

Over a 16-year period such new taxes would produce $13 billion. Existing motor fuel taxes and the tax on tires would bring in $23.6 billion, thus providing more than enough to finance the 13-year, $34.8 billion road building contribution proposed by Congressman George H. Fallon, chairman of the House Subcommittee on Roads, a few weeks ago.

Congress would earmark all the new revenues, as well as the existing tax on gasoline and diesel fuel, for the highway program by placing them in a special trust fund.

The Ways and Means Committee OK'd the pay-as-you-go bill over the outraged protests of the American Automobile Association and the railroads. Secretary of the Treasury George Humphrey also testified that some of the highway-user revenues the committee wants to earmark cannot be used for highways without un-balancing the budget.

(continued on next page)

The AAA, incensed over the 1¢ gasoline tax increase, has launched a "write-your-Congressman" campaign and inspired considerable editorial opposition to the bill through the press. The AAA wants the federal gasoline tax increase to be held to ½¢ and the truckers to pay a greater share of the road program costs.

The consensus among many Congressmen, however, is - "Let's get the program and a reasonable plan of financing authorized so the states know where they stand. We can settle the details at leisure next year."

In fact, the committee wrote into the bill a request that the Bureau of Public Roads and the Interstate Commerce Commission undertake a study of the differential costs of roadbuilding that should be assigned to passenger cars and trucks and report their findings in installments, the first on March 1, 1957.

* * *

Next move is up to the House Public Works Committee where hearings are, at this writing, still going strong on the Fallon authorization bill. Now that the financing proposal has gone as far as it can before being scheduled for floor debate by the whole House, attention shifts to the still controversial provisions in Congressman Fallon's plan. Debate now likely will center on these issues:

- Labor leaders here are determined to force an extension of federal labor rules onto National Interstate System projects. (In New York City last month, the Associated General Contractors of America protested vociferously. Roadbuilders in the Southern states, particularly, are demanding that the provision not be included in the bill.)

- Debate is heated over reimbursement to the states for money spent on toll roads and free roads which have been built to Interstate System standards. Congressmen from Eastern states that have gone ahead with such big projects want credit for their investments. States that haven't are unalterably opposed. It's a hard issue to compromise.

* * *

- Some Congressmen have protested the basis proposed for apportioning the $24.8 billion in Interstate System funds to the states - that is, on the basis of what it would cost to complete the network in each state. Some states underestimated their needs in the BPR survey last year. In this area, fortunately, a feasible compromise has been suggested.

- During the first two years of the accelerated program, funds would be apportioned on the traditional formula and the BPR would undertake another more thorough study of how much each state would need to complete its share of the Interstate System. During the next 5 years, apportionment would be on the basis of need established by that study. A second review would be made after that, to become the basis for apportionment the second 5 years. Such a plan would enable planning to proceed and inequities to be worked out in time.

- Powerful utility interests are very active behind the scenes lining up support for the provision which would give federal sanction to reimbursement of utilities by the state highway departments, for the cost of relocating their facilities. The provision, although it does not say that such costs must come out of the highway money, puts the problem squarely up to the states. Some highway men feel strongly that this will lead to many millions of dollars being siphoned out of the roadbuilding program.

ANOTHER TEST— ANOTHER WIN FOR NEW CAT* LOWBOWL SCRAPERS!

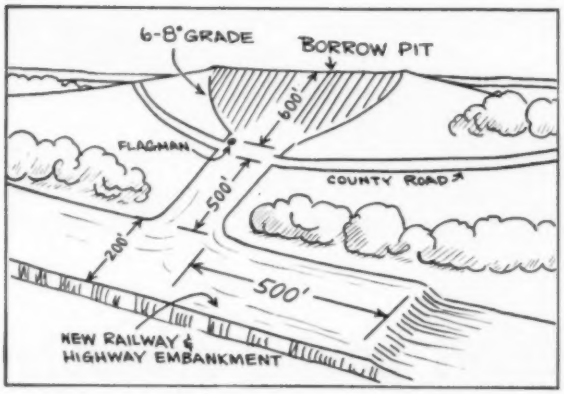
FIRST in loading tests on the Kansas Turnpike against six competing scrapers, including one noncurrent DW21-No. 21, which was runner-up!

FIRST AGAIN, against two DW21-No. 21s, in tests in Iowa!

Test after test in the field proves the ability of the new Cat DW21 (Series C)-No. 470 LOWBOWL Scraper to deliver bigger, faster loads than competing scrapers — including the unit it succeeded, the DW21-No. 21. Here's a recent test made in Iowa. Look it over—see how Caterpillar's exclusive LOWBOWL design pays off in bigger production on the job!

Complete details of this and other on-the-job tests are carried by your Caterpillar Dealer's salesmen. Ask him to show them to you.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



DESCRIPTION OF TEST

JOB AND LOCATION: Highway and railroad relocation near North Liberty, Iowa, involving 600,000 cu. yd. of fill. Contractor: The Stewart and Rank Construction Co., Bettendorf, Iowa.

CONDITIONS: ***Material*** — wet-damp gumbo and red glacial clay mixed with gravel. ***Loading conditions*** — borrow area with 6 to 8% favorable grade, Cat D8 Tractor used for pusher. ***Haul distance*** — 1600 feet. ***Return distance*** — 1600 feet. ***Grade*** — 600 feet of 6 to 8% favorable grade out of borrow area, remainder negligible. Return same route.

AVERAGE CYCLE TIME:	DW21-No. 470 LOWBOWL Scraper	DW21-No. 21s
LOAD	1.00 min.	1.02 min.
HAUL	1.40	1.65
DUMP	.69	.60
RETURN	2.51	2.88
Total no-delay cycle time	5.60	6.15
Wait and delay time (average of all units to facilitate comparison)	.70	.70
TOTAL CYCLE TIME	**6.30**	**6.85**

COMMENTS: Though the DW21-No. 470 LOWBOWL Scraper carried larger loads, the combination of its turbo-diesel horsepower, highly efficient power train and big, wide-section tires gave the unit a 14% advantage in cycle time.

In the dump area, its power, traction and flotation really paid off. Noncurrent models often had to be pushed while unloading — the new machine seldom required pushing.

. . . for more details circle 196, page 16

RESULTS OF IOWA TEST

	DW21-No. 470 LOWBOWL Scraper	Noncurrent DW21-No. 21s without sideboards
Average load in bank cu. yd.	18.9	15.5
Total average cycle time on 3200-ft. round trip	6.30 min.	6.85 min.
Trips per hour	9.5	8.8
Production in cu. yd. per hour	180	133

LOWBOWL ADVANTAGE in bank cu. yd. per hour: 47

NEW CAT DW21 TRACTOR-NO. 470 LOWBOWL SCRAPER New Turbocharged 6-cylinder Cat Engine packs 300 HP at 1800 RPM. Scraper capacity is 25 cu. yd. heaped, 18 cu. yd. struck. Exclusive LOWBOWL design loads more material faster because of less loading resistance. And now advance-design, wide-section tires are standard equipment. These tires give better flotation and traction in soft going.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

BIGGER, FASTER LOADS WITH CAT LOWBOWL SCRAPERS

Gets back on new slab sooner — speeds paving schedules

KOEHRING 16-E *twinbatch*® paver on rubber tires is as mobile as your batch trucks. It works on or off-pavement — can get back on new slab in as little as 7 days to pave adjoining highway strips, scattered intersections, approaches to driveways and side roads. This time-saving "run-about" makes self-powered moves at 9 m.p.h. Yet, for all its mobility, the Koehring 16-E *twinbatch* is primarily a production paver — exceeds the output of large single-drum pavers on main highway work. For instance —

On straight-production paving, the Koehring 16-E hits a top output of 86.7 batches an hour (based on 60-second mixing cycle). This *reserve* production capacity with *twinbatch* Autocycle mixing offsets normal job delays — lets you pick up lost time which cannot be made up with a limited production single-drum paver.

Averages 50 cu. yds. an hour

As a result, the Koehring 16-E *twinbatch* easily maintains an average of over 76 batches an hour — 8 hours a day. Based on 16 cu. ft. per batch, plus the usual 10% overload, this assures you 50 cu. yds. of concrete per hour — with a small crew — on your main-highway paving jobs.

While its usefulness is unlimited as a general-purpose paver, this versatile Koehring 16-E also serves as a mobile concrete mix plant. On construction of curbs, gutters, culverts, bridges, pilings, it discharges into overhead hoppers, forms, chutes, or loads trucks. Elevating boom reaches up and out 60° — gives controlled discharge at 21-foot height (higher with special boom).

See for yourself how the big production capacity, overall versatility, and rubber-tired mobility of this Koehring 16-E *twinbatch* can put you miles ahead on your paving schedules. Get all the facts from your Koehring distributor, or write us for 16-E catalog. Big 34-E *twinbatch* is also available for major highway, airport paving.

KOEHRING Company
Milwaukee 16, Wisconsin

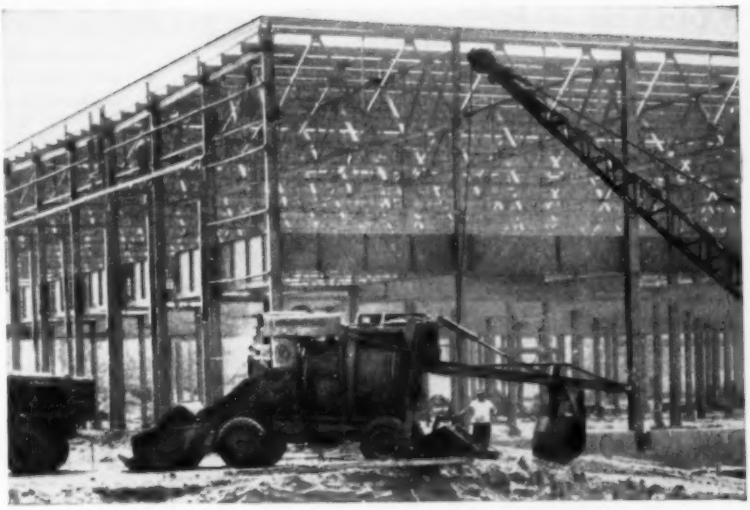
(Koehring Subsidiaries: JOHNSON • PARSONS • KWIK-MIX)

Big rubber-tires are easy on the sub-grade

Notice how there's little or no scuffing on the sub-grade with a Koehring rubber-tired 16-E paver. When working between forms, flotation of the big 11:00 x 20 pneumatic tires protects the grade against surface damage — saves unnecessary filling and re-leveling. This rubber-tired advantage also lets the Koehring 16-E *twinbatch* work on pavement without planking to pour adjoining slabs, widen highway and airport strips, pave intersections, pour concrete for curbs, gutters, culverts.

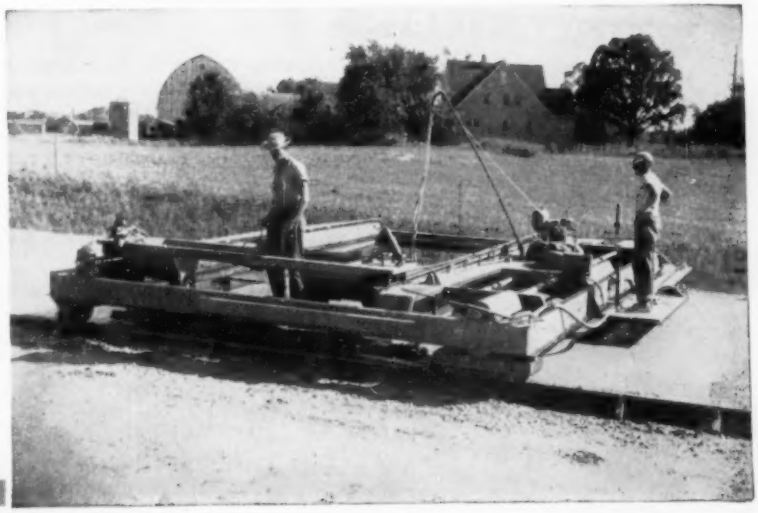
Mobile 16-E paver serves as a concrete mix plant

On building construction, versatile Koehring 16-E *twinbatch* pours footings, floors, columns — is never "grounded". Power-controlled boom swings in a 160° arc, or elevates 60° for overhead discharge — locks and holds in any position. Controlled-discharge bucket dumps anywhere along the 25-foot boom, can be opened or closed at any time for gradual discharge. Water-level capacity of bucket is 24 cu. ft. That's more than ample capacity to hold the full 16 cu. ft. batch of concrete, plus 10% overload.

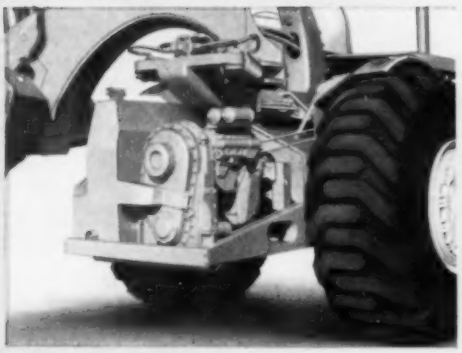


Precision finisher keeps up with any paver

"Timely", precision-finishing is important on any paving job. Operating at almost twice the speed of a 34-E paver, Koehring Longitudinal Finisher handles all practical consistencies of concrete—harsh, wet or dry. It overcomes slump difficulties on grades and elevated curves. Produces mechanically accurate concrete slab surface, 8 to 30 feet wide, with uniform crown transitions.

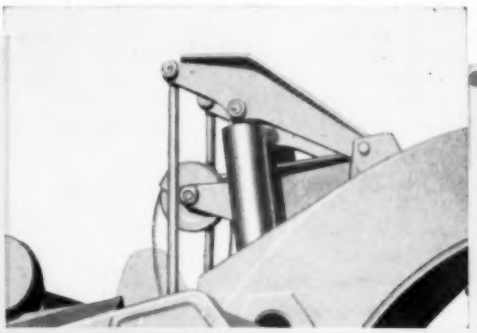


MORE WORKABILITY WITH



ACCESSIBILITY

Accessibility of major components is a cost saving feature of these two new Euclid Scrapers. Easy servicing and maintenance means more working time and more payloads per day. Engine, transmission, drive axle and entire hydraulic system can be serviced or replaced in about half the time required on other scrapers. Illustration shows accessibility of the Torqmatic Drive in the S-18 Scraper.



ADVANCED DESIGN

Euclid's advanced design does away with cable headaches—costly downtime for replacement and repair. All scraper operations . . . bowl, apron and ejector . . . are actuated by husky levers with independent hydraulic control. They're fast and positive . . . not interconnected in any way. All four hydraulic jacks are interchangeable . . . one spare fits anywhere!

Performance that gets More Work Done!

CUTTING BLADES

The cutting blade is another reason you can count on lower maintenance costs with "Euc" Scrapers. All four sections are identical and reversible. By using a straight or drop center blade arrangement you get the most efficient loading under any job condition. Reversing or interchanging the sections . . . a very easy operation . . . provides a completely new cutting edge.

The S-12 has plenty of power and traction to pick up heaped loads in a hurry, even in sandy conditions like this.

With Torqmatic Drive and 300 h.p., the S-18 hauls heaped loads up to 24 cu. yds. at fast travel speeds . . . dumps on the fly.

NEW "EUC" SCRAPERS

THE S-12

12 yds. struck...
14 yds. at 3:1 slope . . . 16 yds. heaped at 1:1 . . . 26.5 x 25 tires . . . 218 h.p. . . . top speed loaded of 28 mph. . . . 9′ 6″ width of cut . . . makes non-stop 180° turn in 31′.

AND THE S-18

18 yds. struck...
21 yds. heaped at 3:1 slope . . . 24 yds. heaped at 1:1 . . . 27.00 x 33 tires . . . 300 h.p. . . . Torqmatic Drive with torque converter and semi-automatic transmission . . . top speed of 20 mph with full payload . . . 10′ width of cut . . . makes non-stop 180° turn in only 36′.

These two new Euclid Scrapers bring you a new high in scraper performance and low cost yardage. Both incorporate the advanced design that have made "Euc" Scrapers the fastest growing line in the industry. With lever action and 4 section cutting blades, and 16 to 18 h.p. per yd. of capacity, they load easy and travel fast. The entire power train of the S-12 and the S-18 is designed for exceptionally good accessibility.

Before you decide on any scraper for your present or future work, check the money saving features of these "Eucs". Your Euclid dealer will be glad to give you facts and figures that show why so many users have found that ***Euclids are your best investment.***

EUCLID DIVISION
GENERAL MOTORS CORPORATION
Cleveland 17, Ohio

Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

PROOF OF LIMA QUALITY

These 29 Limas at The Union Building & Construction Corp. illustrate Lima's ability to furnish a machine designed to fit every job requirement; 7 Type 34-T, 20 ton truck cranes; 1 Type 44-T, 25 ton truck crane; 2 Type 34, ¾ yd. crawler clamshells; 3 Type 44, 1 yd. crawler shovels; 3 Type 703, 1¼ yd. crane-dragline-pullshovel combinations; 1 Type 703SC special crane; 2 Type 802, 2 yd. crawler shovels; 3 Type 803, 2½ yd. shovels; 4 Type 1201, 3½ yd. shovel-crane combinations; 3 Type 1601, 4 yd. shovel-dragline combinations.

The Union Building & Construction Corp. . . .

Relies on fleet of 29 LIMAs for their many diversified jobs

The 29 Limas operated by The Union Building & Construction Corp., Passaic, N. J., are clear evidence of their reliance on Lima quality. Year-after-year, they've added to their fleet of these quality-built machines. Why? Because each of their Limas continues to give them top performance and operating economy on every digging and lifting job . . . without frequent, costly maintenance. That's how Lima quality builds profits for Lima users.

Across the country and around the world, firms like The Union Building & Construction Corp. rely on Limas for profit-making performance. It will pay *you* to contact your nearby Lima distributor for complete details on these quality-built machines . . . or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

COMPARE QUALITY! No other machine gives you as much as LIMA!

1. Moving parts are flame or induction hardened for longer life.
2. Main machinery is placed well back of center of rotation.
3. Anti-friction bearings at all important bearing points.
4. Big capacity drums and sheaves are easy on cables.
5. Propel and swing gears and power take-off are enclosed in a sealed oil bath.
6. Torque converter (optional).
7. Wherever you are, you can depend on skilled service and nearby warehouse stocks of parts.

COMPARE and you'll specify LIMA for shovels (to 6 yds.), cranes (to 110 tons) and draglines (variable). Smaller capacities available on rubber.

LIMA SHOVELS · CRANES · DRAGLINES · PULLSHOVELS

BALDWIN-LIMA-HAMILTON

Construction Equipment Division · LIMA · OHIO · U. S. A.

DISTRIBUTORS IN PRINCIPAL CITIES OF THE WORLD

. . . for more details circle 188, page 16

CLIPPER *Sells* MORE... *Because* CLIPPER *Sells* QUALITY!

BLADE *for* BLADE
CUT *for* CUT...
Your BEST BUY is CLIPPER!

● Clipper offers the only complete range of DIAMOND BLADES... and GREEN-CON ABRASIVE BLADES for all concrete sawing jobs. Use DIAMOND BLADES for green or cured concrete with ANY aggregate! Use GREEN-CON ABRASIVES for cutting green concrete. Clipper's FACTORY-TRAINED REPRESENTATIVES are always on call to help you with your concrete sawing problems.

You Cannot Buy A Better Blade than Clipper!

Remember...
CLIPPER *Sells* MORE
Because...
CLIPPER *Sells* QUALITY!

Clipper KANSAS CITY, MO.

Better Mail the Coupon NOW!

● Genuine Clipper Products are Sold Only Direct, by Factory-Trained Representatives from Factory Branches in Principal Cities, Coast to Coast. Consult Your Phone Book, or Mail Coupon for Same-Day Service.

CLIPPER MANUFACTURING CO.
2820 E. Warwick • Kansas City 8, Mo. 525X

- ☐ Send information on CLIPPER GREEN-CON ABRASIVE BLADES FOR Green Concrete Sawing.

I'd also like to know about:

- ☐ Diamond Blades for Concrete Sawing
- ☐ Concrete Saws
- ☐ Masonry Abrasive and Diamond Blades
- ☐ Masonry Saws
- ☐ Please have my FACTORY-TRAINED REPRESENTATIVE Call on me.

NAME_____

ADDRESS_____

CITY_____ STATE_____

. . . for more details circle 204, page 16

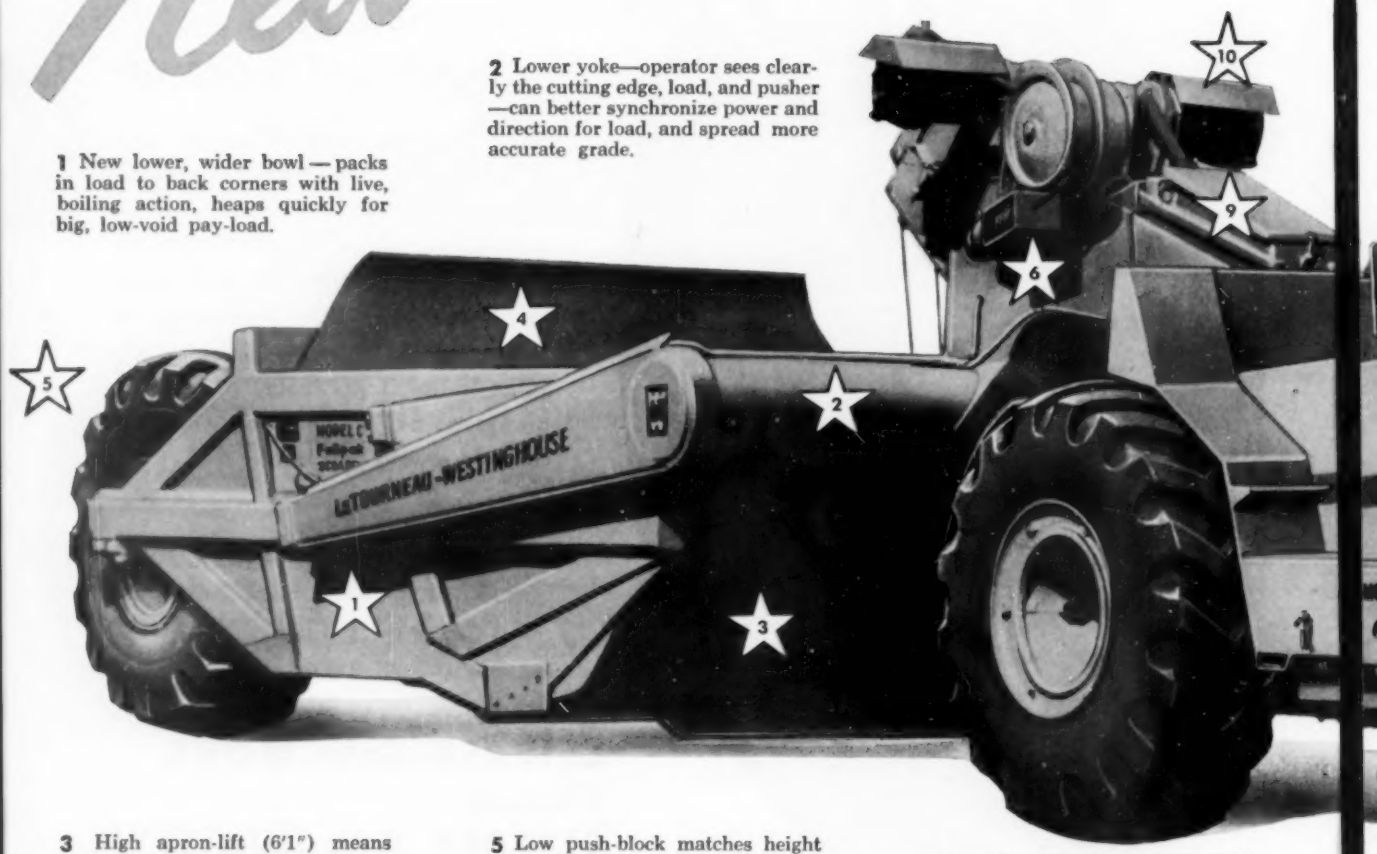
Low, wide bowl of Fullpak Scraper with 9½' blade gives live, boiling action that quickly fills back corners, heaps high fast for big payloads.

Fullpak Scraper is ruggedly built, with double-steel bottom reinforced by welded steel filler-channels. Box-beam construction reduces dead-weight, increases strength. Sturdy push-block (43" x 16") pushing directly to blade through scraper-bottom, maintains contact with pusher over rough or bumpy ground.

New Model C Fullpak

1 New lower, wider bowl — packs in load to back corners with live, boiling action, heaps quickly for big, low-void pay-load.

2 Lower yoke—operator sees clearly the cutting edge, load, and pusher —can better synchronize power and direction for load, and spread more accurate grade.



3 High apron-lift (6'1") means fast, easy unloading of chunky materials and rocks.

4 Positive forward-ejection of load, wipes bowl clean of all materials, including mud and sticky clay.

5 Low push-block matches height of crawler-tractor push-plates, applies power in direct line with cutting-edge to utilize full horsepower and tractive effort.

6 Quick-release clutch on scraper, with fast electric hoist, permit rapid "pumping" action of bowl, for speedy loading of loose materials.

7 Powerful 208 hp C Tournapull prime-mover—with constant-mesh, or sliding-gear transmission — has speeds to 30 mph.

8 Exclusive, power-transfer differential matches pull to traction, makes Tournapull best "mudder" in the earthmover field.

Tournapull, Rooter—Trademark Reg. U.S. Pat. Off., Fullpak—Trademark

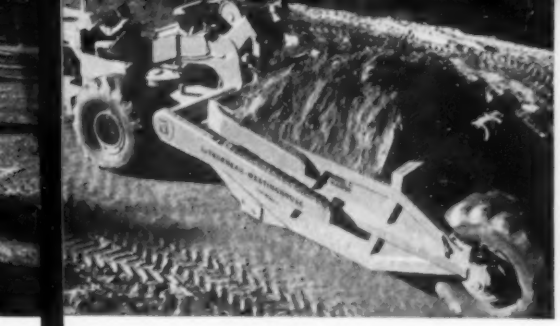
Tractors

Rear-Dumps

Graders

TraveLoaders

Bottom-Dumps, Cranes, Flat-Beds, Elegraders, Rollers, Snow Plows, Logging Arches and Skidders, Scrapers and PCU's, Rooters, Root Rakes, Wire Rope



Curved deflector-plate on top of tail-gate, together with curved apron, give best boiling action for fast heap, eliminate spill, help fill corners. Wheels inside cutting edge make precision work possible next to banks and on slopes.

Big 208 hp Model C Tournapull prime-mover with Fullpak Scraper makes 180° turn in 31' 2", rides on 4 big 26.5 x 25, 26-ply rating, low-pressure tires, travels up to 30 mph over highways and cross-country.

Scraper *18 cu. yards heaped*

Loads faster... boils better...

9 Power-steer on geared king-pin permits 90° turn, swings prime-mover side-to-side in soft going, placing drive-wheels on firm footing to "walk" out of mire.

10 Push-button control makes handling easy. Brushless, all-weather electric motors at point-of-action give instant steer-and-scraper control, minimize cable needs.

You've never seen a scraper that loads as *easy* and heaps as *fast* as this new LeTourneau-Westinghouse Model C Fullpak Scraper.

New Fullpak low, wide bowl, loads up to 18 cubic yards heaped capacity with minimum of loading resistance. Low push-block matches height of tractor push-plates. Direct line application of power from pusher to blade, makes easier, faster loading.

The "low and wide" design of this new Fullpak Scraper helps get more "boiling" action, makes it easy to fill back corners as well as apron, packs in a big load *fast*. Wheels are inside cutting edge, for precision finish work next to banks and on slopes. Positive, forward ejection forces out sticky as well as dry material ... wipes bowl clean each load. High apron lift (6'1") permits all material to be quickly and cleanly unloaded. Fullpak Scraper spreads in accurate lifts to meet any construction requirement.

Powerful, improved 208 hp Model C Tournapull prime-mover has the famous power-transfer differential that keeps pulling-traction on both drive wheels at all times ... also geared king-pin power steer that can turn 90° and "walk" Tournapull out of mud and loose sand that stalls ordinary prime-movers. You have top speeds to 30 mph, with choice of sliding-gear or constant-mesh transmission.

This new 18-yard, faster-loading Fullpak Scraper means more pay yards for you

Before you buy your next scraper, get full information on this new Fullpak 18-yard C Tournapull. Contact your local Distributor for complete details.

P-1024-G

LeTourneau-WESTINGHOUSE Company

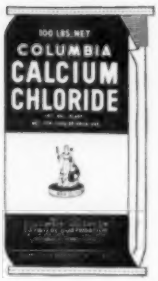
Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

IT'S SPRING...

time to treat unpaved roads with

COLUMBIA CALCIUM CHLORIDE



UNTREATED

TREATED

Treat unpaved roads now to provide dust-free surfaces at low cost. Shaping to proper crown while the spring moisture is still in the ground and treating with Columbia Calcium Chloride will put surfaces in excellent condition for summer traffic.

REDUCED MAINTENANCE COST

Preserves Road Materials

Treating with Columbia Calcium Chloride cuts annual gravel loss up to 75 per cent. Negligible losses in aggregates mean big savings in year-round maintenance costs.

Reduces Blading Requirements

Good calcium chloride roads seldom require more than 3 or 4 bladings per year resulting in further savings.

BETTER PUBLIC RELATIONS

Controls Dust

Columbia Calcium Chloride virtually eliminates dust, even under driest conditions.

Gives Smoother Riding

Proper treatments keep surfaces firm, compact and smooth in all types of weather. Driving is comfortable and safe.

The road to fine performance and low maintenance costs is Columbia Calcium Chloride.

For further information and the name of your closest supplier, write today to your nearest district office or our Pittsburgh address.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati
Charlotte • Chicago • Cleveland
Boston • New York • St. Louis
Minneapolis • New Orleans
Dallas • Houston • Pittsburgh
Philadelphia • San Francisco
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

. . . for more details circle 206, page 16

On cleanup work, "D's" loaded rock and excess material from road shoulders and disposed of them in waste areas.

How Union Building & Construction cut cleanup time and cost on Indiana Turnpike

Handyman "D's" with 28 mph speed for cleanup work, proved big time-savers for the Union Building & Construction Co., of Passaic, N. J., on the Indiana Turnpike.

Handle cleanup and sub-grading

Typical cleanup work, on a 13.1-mile section of the turnpike, had 3 D Tournapulls self-loading and hauling excess materials from shoulders to nearby waste areas. The "D's" speed and mobility paid off, because cleanup assignments were scattered over many sections of the turnpike.

Sometimes, these handy scrapers hauled rock and excess materials a few hundred feet, sometimes thousands of feet, depending upon how far the cleanup area was located from the fills. After completing cleanup work, the three "D's" hauled gravel subbase and spread it along shoulders and backslopes prior to landscaping. Two other D Tournapulls were profitably used spreading topsoil along shoulders and backslopes. Occasionally, when this work was caught up, they were used for production dirtmoving on cut-and-fill.

When photos were taken on the job, nearly 400,000 sq. yds. of topsoil 2″ deep had been placed. This total was accomplished, using 2 to 5 "D's" as available, and when needed.

"Hard to beat"

According to this contractor, "D's" versatility played an important part on this 3,500,000-yard job. They had also done outstanding work on other assignments, too. For example, recently 2 "D's" placed over 1,000,000 sq. yds. of topsoil 4″ deep, some of it down 4 to 1 slopes, on the Garden State Parkway in New Jersey.

Foreman Wayne Shumaker said, "These Tournapulls do finer work and get around quicker than other small rigs." Operator Ernest J. Janssen added, "'D's' are easy to operate, especially for finishing. In close work, they're hard to beat!"

For speed and mobility on cleanup, and other odd-job assignments, as well as in production hauling, check D Tournapulls today. Call or write your LeTourneau-Westinghouse Distributor for all the facts.

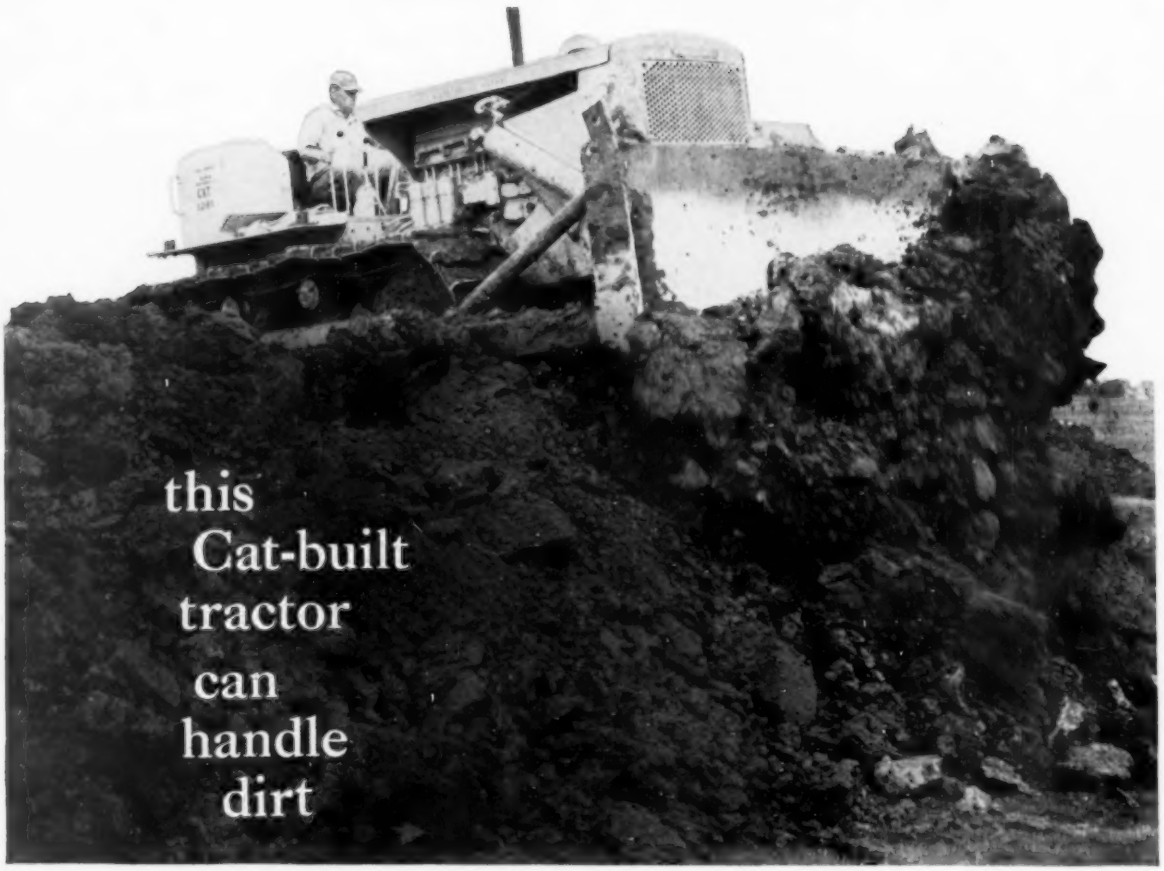
Filling in gravel subbase, "D's" maintained even flow of material along shoulders by spreading on the run.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-935-H-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company



. . . with Caterpillar filter refills

Your Caterpillar dealer well knows the damage that dirt-laden oil can do to your tractor. Precision parts can be ruined in a matter of hours if unfiltered oil gets into the engine. That's why he always insists on giving you Caterpillar replacement filters. Built to meet the specific requirements of your engine by Purolator, they can handle all the volume your Cat-built tractor requires . . . they never let oil "by-pass" the filter . . . never let harmful abrasives enter the engine.

It's common sense to do as your Caterpillar dealer does . . . insist on Caterpillar filter refills. The life of your engine is at stake.

PUROLATOR

"FIRST IN THE FIELD OF FILTERING"

PUROLATOR PRODUCTS, INC., Rahway, New Jersey, and Toronto, Ontario, Canada

. . . for more details circle 247, page 16

On highway construction, road maintenance, ditching, terracing, finish grading, spreading road mix, land leveling, Adams 660 gives you the extra power, speed, and stamina to do all of these jobs *faster, better,* and at *lowest* cost.

Here's Why

you should check the ADAMS 660 against your present heavy-duty graders

A lot has happened to the BIG grader field in the last year or two. For instance, if you have one of the 115 hp competitive graders that were "BIG" a few years ago, Adams 660 can now give you . . .

1. 30% more horsepower for deeper cuts, harder materials, faster cycles.
2. 29% more weight on drive wheels to apply more power, get more work done faster.
3. 35% higher travel speed to cut non-productive time between work assignments.
4. 117% higher reverse speed for more cycles per hour on shuttle grading.
5. 33% extra forward-speed-selection of power to match your load. With optional creeper gears, 83% extra choice in geared speeds (¼ to 26 mph) for increased accuracy and more effective application of power to difficult work.
6. 100% additional backing-speed selection that cuts waste time on return cycles, improves production on back-up grading.
7. 19% more front-axle clearance to work larger windrows and come in and out of ditches without interference.

In addition, all gears in the "660" constant-mesh transmission are on anti-friction bearings for easy operation, less wear, less maintenance cost. Adams rubber-mounting of engine keeps vibration from traveling to machine and operator. Automatic braking of "660" transmission, when applying hydraulic brakes to wheels, gives you safer operation with less wear on brake linings, and less pedal effort. Because "660" power-box clutches shift on ball bearings, you have less wear . . . easier, smoother-operating controls.

It's a good time now to review your grader equipment, a good year to make needed replacements before the big rush comes to fill needs of the huge expansion in new federal-financed highway construction. We'll be glad to help you make a fair and realistic analysis of your grader equipment and grader needs. We'll be glad to give you every opportunity to compare the Adams 660 . . . or smaller models . . . with your present equipment or with *any* competitive grader.

Wouldn't *now* be a good time to talk it over? We can give you better deliveries and better deals now than we can later on . . . that is, if we can prove to you that we have the best grader for *your* work, and if you decide that now is the time for *you* to buy.

Multiply the uses of your Adams grader with optional equipment: Scarifier, for ripping old asphalt and hard-packed surfaces; Bulldozer, for pushing debris from grade, backfilling around culverts, etc.; "V" Snow Plow and Wing, for cleaning highways and country roads of snow and ice; and Elegrader, for plowing and loading, or sidecasting materials.

A size ADAMS for every need

Model 660—150 hp diesel engine, 27,730 lbs.
Model 550—123 hp diesel engine, 23,500 lbs.
Model 440—104 hp diesel engine, 21,500 lbs.
Model 330— 80 hp diesel engine, 20,500 lbs.

TraveLoader — A high-speed, heavy-duty, self-propelled, belt-type loader for picking up materials and loading into trucks from windrows or stockpiles, 55 hp gasoline or 60 hp diesel engine, 16,800 lbs.

AG-29-G-b

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

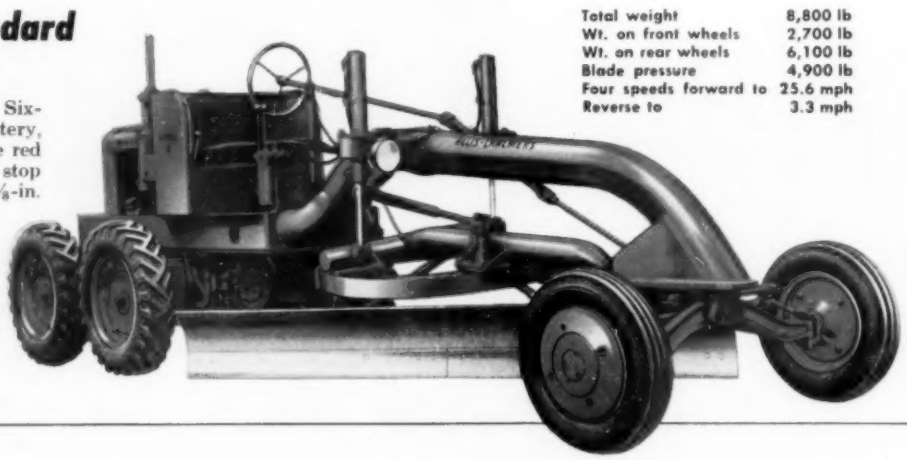
A Subsidiary of Westinghouse Air Brake Company

Model D *Standard*

(GASOLINE ENGINE)

Standard Equipment: Six-volt electric generator, battery, two white headlights, one red combination rear and stop light, muffler, 10-ft by ⅝-in. moldboard, hydraulic controls for moldboard lift, four 7.50-20 (6 ply) rear and two 6.50-16 (6 ply) front pneumatic tires with regular tubes.

Total weight	8,800 lb
Wt. on front wheels	2,700 lb
Wt. on rear wheels	6,100 lb
Blade pressure	4,900 lb
Four speeds forward to	25.6 mph
Reverse to	3.3 mph



Match your grading needs with

from the Allis-Chalmers model D motor grader line

Model D Diesel *Standard*

Total weight	9,350 lb
Wt. on front wheels	2,760 lb
Wt. on rear wheels	6,590 lb
Blade pressure	4,900 lb
Four speeds forward to	25.2 mph
Reverse to	3.2 mph

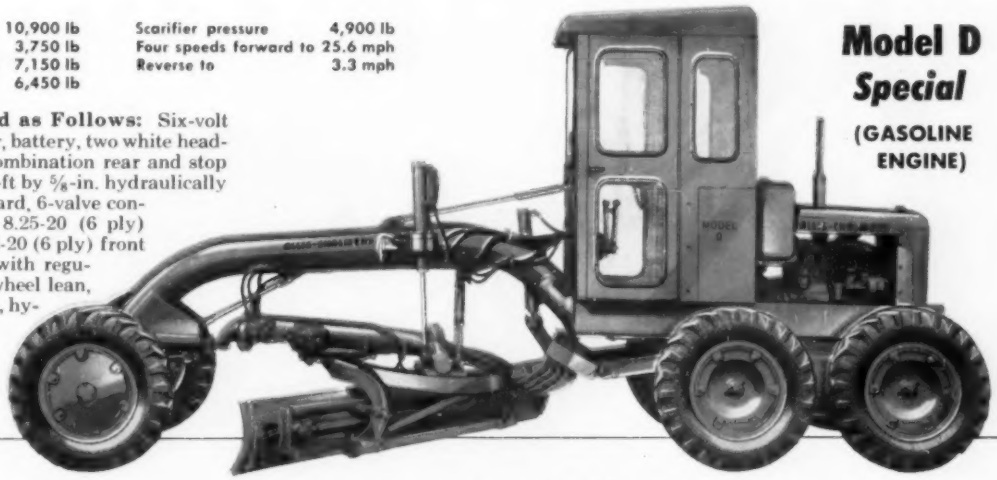
Standard Equipment: Twelve-volt electric generator, battery, two white headlights, one red combination rear and stop light, muffler, 10-ft by ⅝-in. moldboard, hydraulic controls for moldboard lift, four 7.50-20 (6 ply) rear and two 6.50-16 (6 ply) front pneumatic tires with regular tubes.

Both gasoline and diesel Model D's are available with any combination of accessories.

You can still buy a Model D for one-third the cost of a large motor grader, and it's the most popular, most versatile small grader on the market. In addition to the units illustrated, the Model D is available with other combinations of accessories . . . or with any of these useful attachments: rear-mounted ⅝-cu-yd loader; shoulder maintainer; one-pass windrow eliminator; V or blade-type snowplows. Ask your nearby Allis-Chalmers dealer for a demonstration . . . and prove the Model D's value to yourself.

Total weight	10,900 lb	Scarifier pressure	4,900 lb
Wt. on front wheels	3,750 lb	Four speeds forward to	25.6 mph
Wt. on rear wheels	7,150 lb	Reverse to	3.3 mph
Blade pressure	6,450 lb		

Fully Equipped as Follows: Six-volt electric generator, battery, two white headlights, one red combination rear and stop light, muffler, 10-ft by 5/8-in. hydraulically shiftable moldboard, 6-valve control group, four 8.25-20 (6 ply) rear and two 8.25-20 (6 ply) front pneumatic tires with regular tubes, front wheel lean, power circle turn, hydraulic scarifier, all-steel cab.



Model D
Special
(GASOLINE ENGINE)

new economy and efficiency

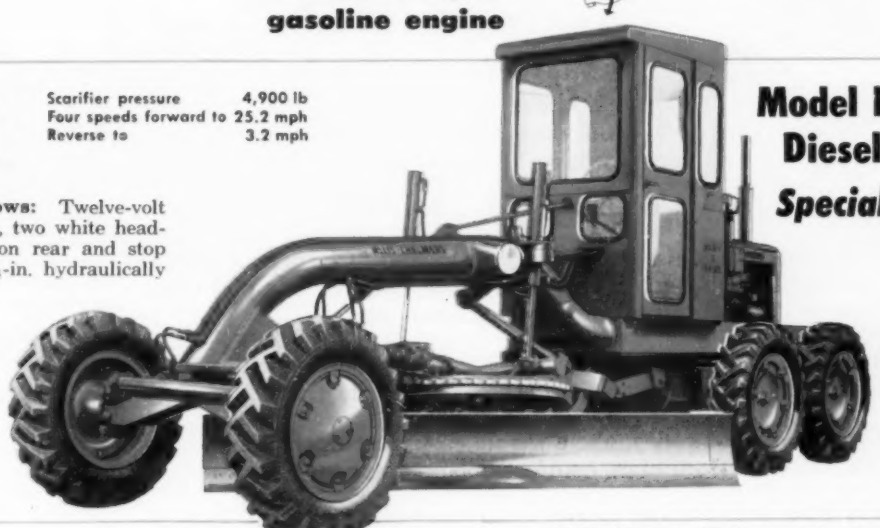
NOW AVAILABLE WITH YOUR CHOICE OF TWO OUTSTANDING ALLIS-CHALMERS ENGINES

50-hp POWER-CRATER gasoline engine

50-hp diesel engine with follow-through combustion

Total weight	11,450 lb	Scarifier pressure	4,900 lb
Wt. on front wheels	3,750 lb	Four speeds forward to	25.2 mph
Wt. on rear wheels	7,700 lb	Reverse to	3.2 mph
Blade pressure	6,450 lb		

Fully Equipped as Follows: Twelve-volt electric generator, battery, two white headlights, one red combination rear and stop light, muffler, 10-ft by 5/8-in. hydraulically shiftable moldboard, 6-valve control group, four 8.25-20 (6 ply) rear and two 8.25-20 (6 ply) front pneumatic tires with regular tubes, front wheel lean, power circle turn, hydraulic scarifier, all-steel cab.



Model D Diesel *Special*

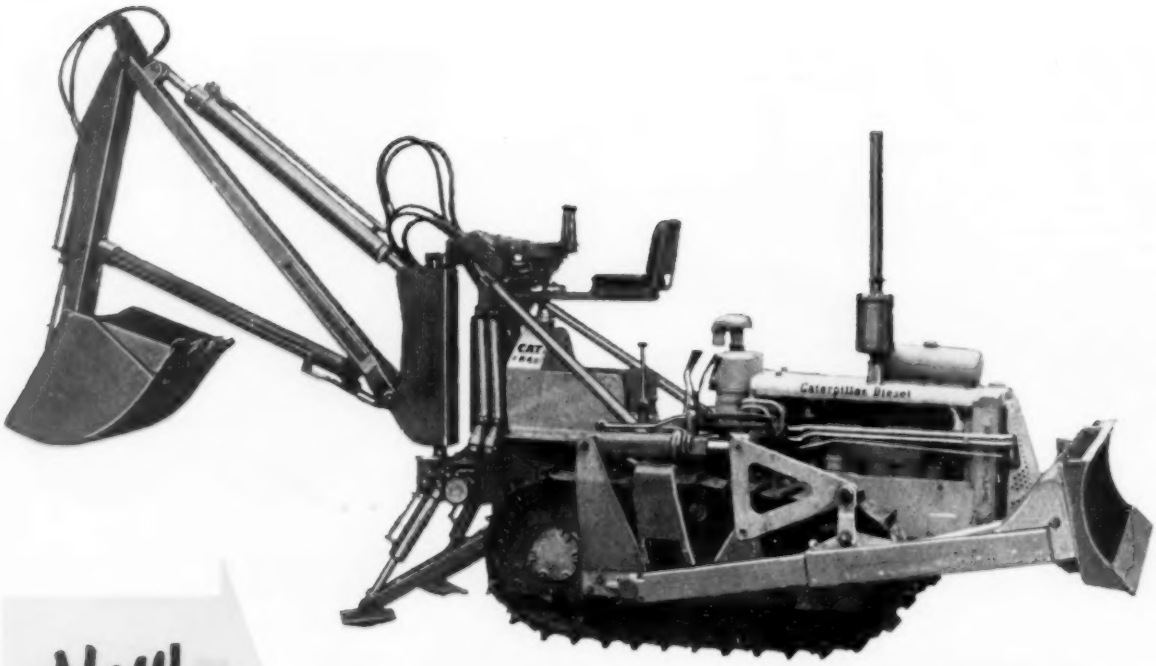
POWER-CRATER is an Allis-Chalmers trademark

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

. . . for more details circle 178, page 16



New HYDRAULIC D-4 BACKHOE

1/2 yard capacity

A MAJOR ADVANCE IN THE TRACTOR-MOUNTED BACKHOE FIELD

HYSTER — The Only Backhoe Designed *Specifically* for the Caterpillar D-4 Tractor

The new Hyster D-4 Backhoe digs anywhere a track-type tractor can go! Digs down to 13 feet, loads up to 9′ 7½″.

You get these outstanding operating benefits:

3 Dippers Available — giving 13″, 21″ and 29″ cutting width. Equipped with replaceable alloy steel points crimped onto adapters from bottom for easy replacement.

Retractable Hydraulic Outriggers provide full machine stability. Can be raised to allow 17″ clearance in travel.

Convenient Controls make possible easy, fast operation—with full visibility from high, comfortable operator seat.

. . . Plus many other advanced features, making the Hyster Hydraulic D-4 Backhoe one of the fastest, most profitable digging machines available, regardless of footing or terrain conditions.

FULL TRACK OSCILLATION. Equalizer arrangement provides true track-type tractor mobility to move about with ease over rough terrain. Equalizer can be locked to provide rigid machine while digging.

FULL SWING POWER is maintained through a 240 degree arc. Makes possible higher digging efficiency. Rack-and-gear type swing mechanism is fully protected and sealed in oil bath.

FOR FULL INFORMATION CALL YOUR CATERPILLAR TRACTOR CO. DEALER

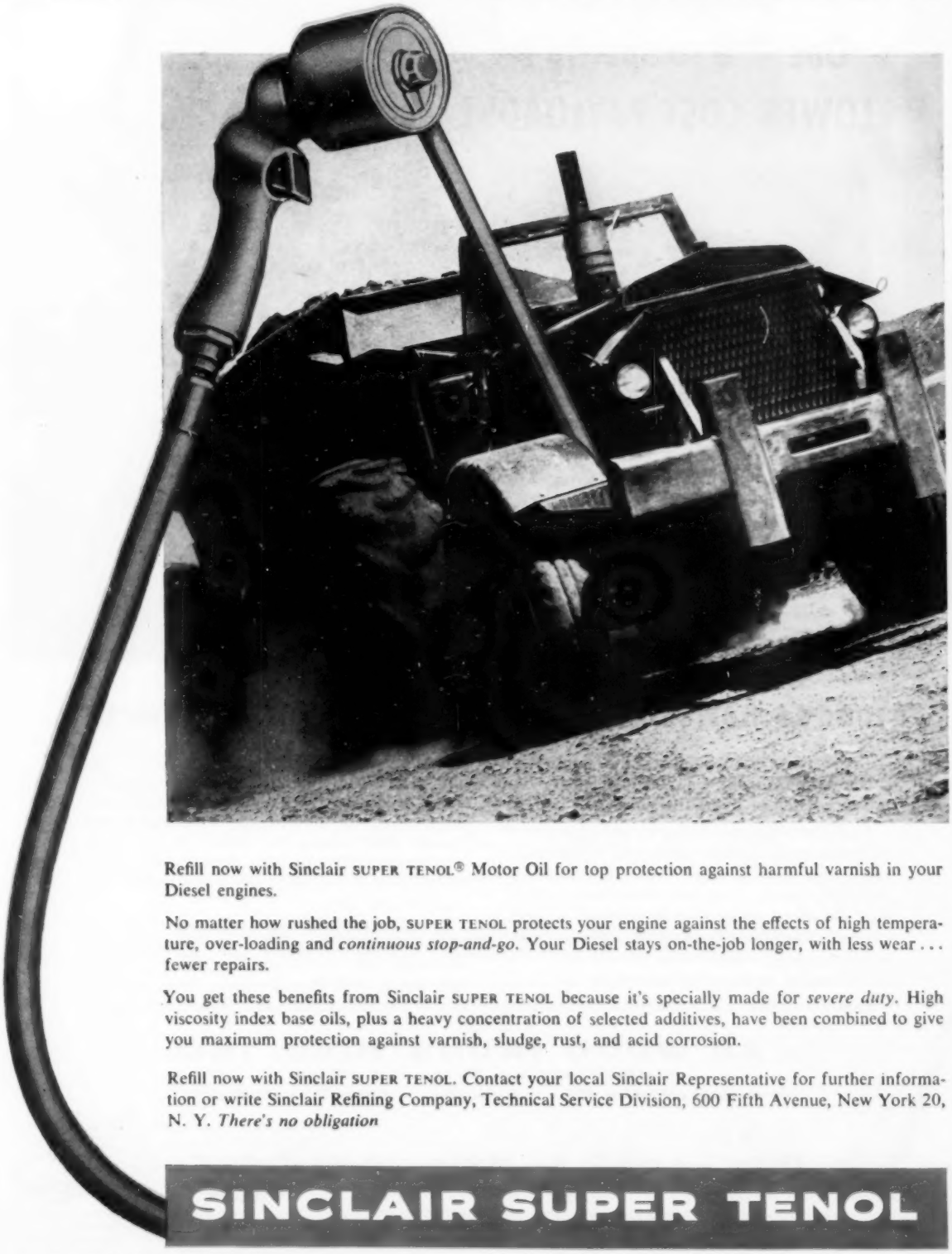
• He is also your HYSTER Dealer •

HYSTER COMPANY

2995 N. E. Clackamas Street, Portland 8, Oregon,
1895 N. Adams Street, Peoria 1, Illinois.
Portland, Oregon; Peoria, Illinois; Nijmegen, The Netherlands

. . . for more details circle 226, page 16

STOP VARNISH!



Refill now with Sinclair SUPER TENOL® Motor Oil for top protection against harmful varnish in your Diesel engines.

No matter how rushed the job, SUPER TENOL protects your engine against the effects of high temperature, over-loading and *continuous stop-and-go*. Your Diesel stays on-the-job longer, with less wear . . . fewer repairs.

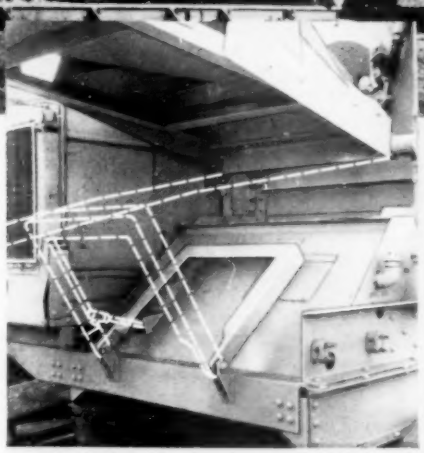
You get these benefits from Sinclair SUPER TENOL because it's specially made for *severe duty*. High viscosity index base oils, plus a heavy concentration of selected additives, have been combined to give you maximum protection against varnish, sludge, rust, and acid corrosion.

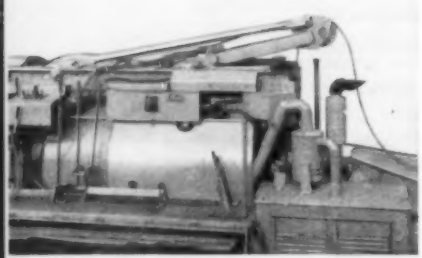
Refill now with Sinclair SUPER TENOL. Contact your local Sinclair Representative for further information or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation*

SINCLAIR SUPER TENOL

. . . for more details circle 255, page 16

NOW...



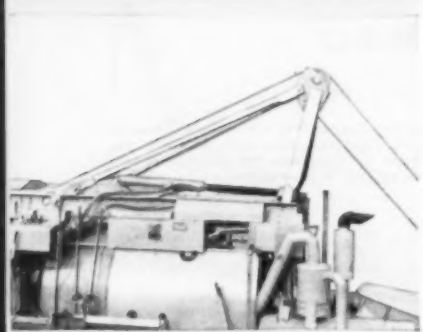


A-Frame Down

With the A-Frame in the down position, as shown at upper left, the MultiFoote Paver overall height is instantly reduced to clear bridge or overpass. This low clearance not only facilitates traveling under low overhead structures but also aids in transporting.

A-Frame Up

By touching a hydraulic control lever the A-Frame is quickly raised and the MultiFoote is ready for operation, as shown in lower left. With this arrangement the MultiFoote Paver has retained all the advantages of single cable operation.

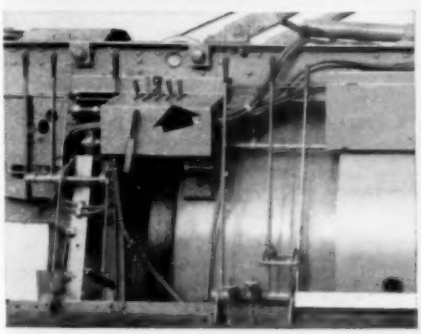


Skip Carrier

When traveling with the A-Frame folded down, the skip rests on a hydraulically controlled skip carrier, as shown by the dotted lines in the photo at upper right. When the paver is working, the bracket folds down against the frame, out of the way.

Operator's Platform and Controls

Five small finger operated levers in the picture at lower right control hydraulic cylinders which actuate A-Frame, skip carrier bracket, transfer, discharge and bucket spotting. All controls are centrally located for ease and speed of operation.



NEW LOW CLEARANCE HEIGHT and COMPLETE HYDRAULIC CONTROLS make the MULTIFOOTE even better

New Design Cuts Cycle Time by giving you Faster Skip Operation PLUS—faster travel preparation • faster bucket spotting • faster discharge

MultiFoote Pavers with these new hydraulic controls and faster skip operation give you an even faster cycle time than before, *plus a new low overall clearance height.* You get all the advantages of single-cable skip control with its high speed, simple reeving and low maintenance cost. Now in a matter of a few seconds, the operator can raise the skip carrier bracket and lower the A-frame with fast-acting hydraulic cylinders to get under overpasses, bridges or other low overhead clearances.

Hydraulic controls also step up the high capacity of the MultiFoote by faster batch transfer, faster discharge chute operation and faster bucket spotting. These hydraulic controls plus the faster skip operation now mean that you can put out more concrete with a Blaw-Knox Paver than any other paver.

All the features that have made MultiFoote Pavers the leaders in their field have been retained or improved. The efficient double-cone drum folds material over and over for thorough mixing, has no corners for material to build up in and cleans itself with a scouring action. High operator's platform gives the operator an unobstructed view of skip and bucket at all times—there are no "dead spots." Efficiently grouped controls for manual and automatic cycle operation cut seconds out of the mixing time for each batch. Shovel-type crawlers with their self-cleaning action give positive traction, ample flotation on soft grades and are designed to stand up to miles of highway paving travel. Volume measurement, non-pressure water system that is unaffected by grade, the wide, smooth rigidly mounted skip and simplicity of design assure shift-after-shift high capacity and easy upkeep.

If you are bidding on turnpike work or any big paving job, see your Blaw-Knox Distributor and get all the details on the New MultiFoote with hydraulic controls.

BLAW-KNOX

BLAW-KNOX COMPANY

Construction Equipment Division, Mattoon, Illinois

. . . for more details circle 192, page 16

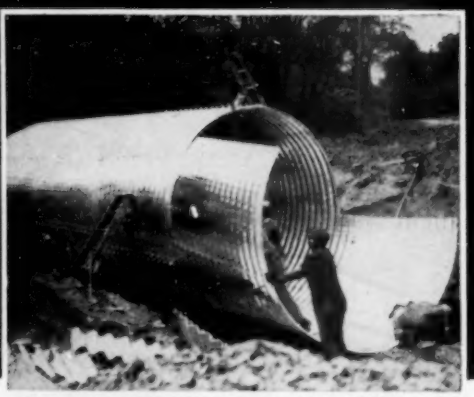
located for ease and speed of operation.

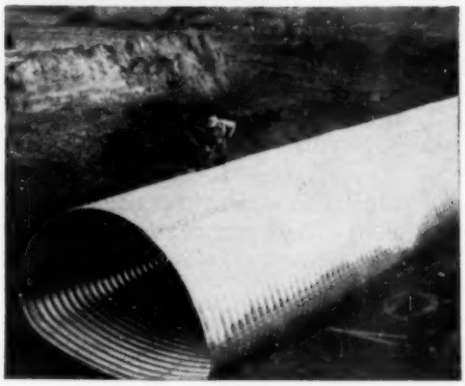
NOW AVAILABLE . . .

A new service by American Bridge to help you build low-cost drainage structures in record time

AMBRIDGE SECTIONAL PLATES

for pipes, arches and pipe-arches





AmBridge Sectional Plates are designed to save you valuable time and money in building low-cost drainage structures.

Made from USS Pure Iron or USS Copper Steel (whichever is stipulated in your particular specifications), AMBRIDGE Sectional Plates for pipes, arches and pipe-arches are fabricated to meet the specifications of the American Association of State Highway Officials and can be adapted to all state, railroad and government specifications.

AMBRIDGE Sectional Plates are fabricated in 2" deep corrugations on 6" centers with standard punching. *They are galvanized after fabrication.*

AMBRIDGE Sectional Plates are furnished to accommodate any shape or size of pipe, arch, or pipe-arch complete with bolts. Special details, such as asphalt coating, hook bolts, beveled ends, and skewed ends, are furnished as specified for each job.

ASK FOR DESCRIPTIVE FOLDER. For further information about AMBRIDGE Sectional Shapes, we suggest that you contact the office nearest you. Or, an inquiry direct to our Pittsburgh headquarters will bring detailed information. Just ask for the folder on Sectional Plates.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE • ATLANTA • BALTIMORE • BIRMINGHAM • BOSTON • CHICAGO
CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • ELMIRA • GARY • HOUSTON
LOS ANGELES • MEMPHIS • MINNEAPOLIS • NEW YORK • ORANGE, TEXAS • PHILADELPHIA
PITTSBURGH • PORTLAND, ORE. • ROANOKE • ST. LOUIS • SAN FRANCISCO • TRENTON
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMBRIDGE *Sectional* **PLATES** USS

UNITED STATES STEEL

. . . for more details circle 183, page 16

. . . for more details circle 192, page 16

These two Allis-Chalmers HD-16 Crawler Tractors, one pulling and one pushing a scraper, are both equipped with A-C Torque Converter Drive — which incorporates Twin Disc Torque Converter components.

6 profitable reasons why you need a *torque converter* in your crawler tractors

For higher work output and longer equipment life, more and more contractors are ordering their new Allis-Chalmers HD-16 Crawler Tractors *complete* with A-C Torque Converter Drive. (The HD-21 has converter drive as standard equipment.)

Torque converter drive offers *six profitable, proved* advantages applicable to *your* crawler tractors. 1. Three-stage design provides the highest engine output torque multiplication available — eliminating harmful, costly engine lugging and stalling. 2. Engines work up in the maximum efficiency range *all* the time, delivering *constant* high-horsepower output . . . *doing more work* than units equipped with mechanical drive. 3. Power is *automatically* matched to load demands, with gear-shifting minimized or eliminated — where mechanical transmissions must *stay* in the starting gear ratio, even after starting load resistance is reduced . . . operator efficiency is boosted. 4. Heavy load pick-up is smooth, even, without clutch slippage . . . better flotation is obtained. 5. Overloads, shock loads and vibrations are cushioned *out,* through *fluid* connection . . . providing longer tractor life with less maintenance. 6. Infinite variety of ratios are available to work with, permitting smooth, accurate control of loads and delicate "inching" under power.

Wherever earth and rock are moved, owners are using these six basic advantages *to convert their horsepower into more profits.* That's why Allis-Chalmers designed torque converter drive into their HD-16 and HD-21 Crawler Tractors. Since 1940, they have worked closely with Twin Disc Engineers, and have standardized on Twin Disc Torque Converter Components.

Be sure there's a torque converter in *your* next Allis-Chalmers HD-16! See your tractor dealer *today,* for complete information on A-C Torque Converter Drive.

TWIN DISC

TWIN DISC

Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division) Rockford, Illinois

. . . for more details circle 269, page 16

B.F.Goodrich

All-Nylon Universal tires eliminate impact breaks for rock company

LONG ROCK COMPANY of Princeville, Illinois, has hauled thousands of tons of stone in the past few years from quarry to crusher to road-construction site. Trucks must travel over rock and rough roads—conditions that used to rip and tear tires and run up costs.

Then Long Rock switched to new B. F. Goodrich *all-nylon* Universal tires. "These tires," writes James Long, "have eliminated impact breaks and do a fine job of resisting cuts and abrasions. Our switch to your *all-nylon* Universal tires has saved us down-time and hundreds of dollars annually."

B. F. Goodrich Universal tires give such outstanding service because the tread is specially compounded to resist rock cuts. The *all-nylon* cord body withstands double the impact of ordinary materials, resists heat blowouts and flex breaks. No wonder the *all-nylon* body outwears even the extra-thick tread, *can still be recapped over and over!*

See your B. F. Goodrich retailer today and find out how you can get longer service at lower cost with B. F. Goodrich *all-nylon* Universal tires. Or write *The B. F. Goodrich Co., Tire & Equipment Div., Akron 18, Ohio.*

"WE WOULDN'T USE any tires in our operations that were not of B. F. Goodrich *all-nylon* construction," writes James Long.

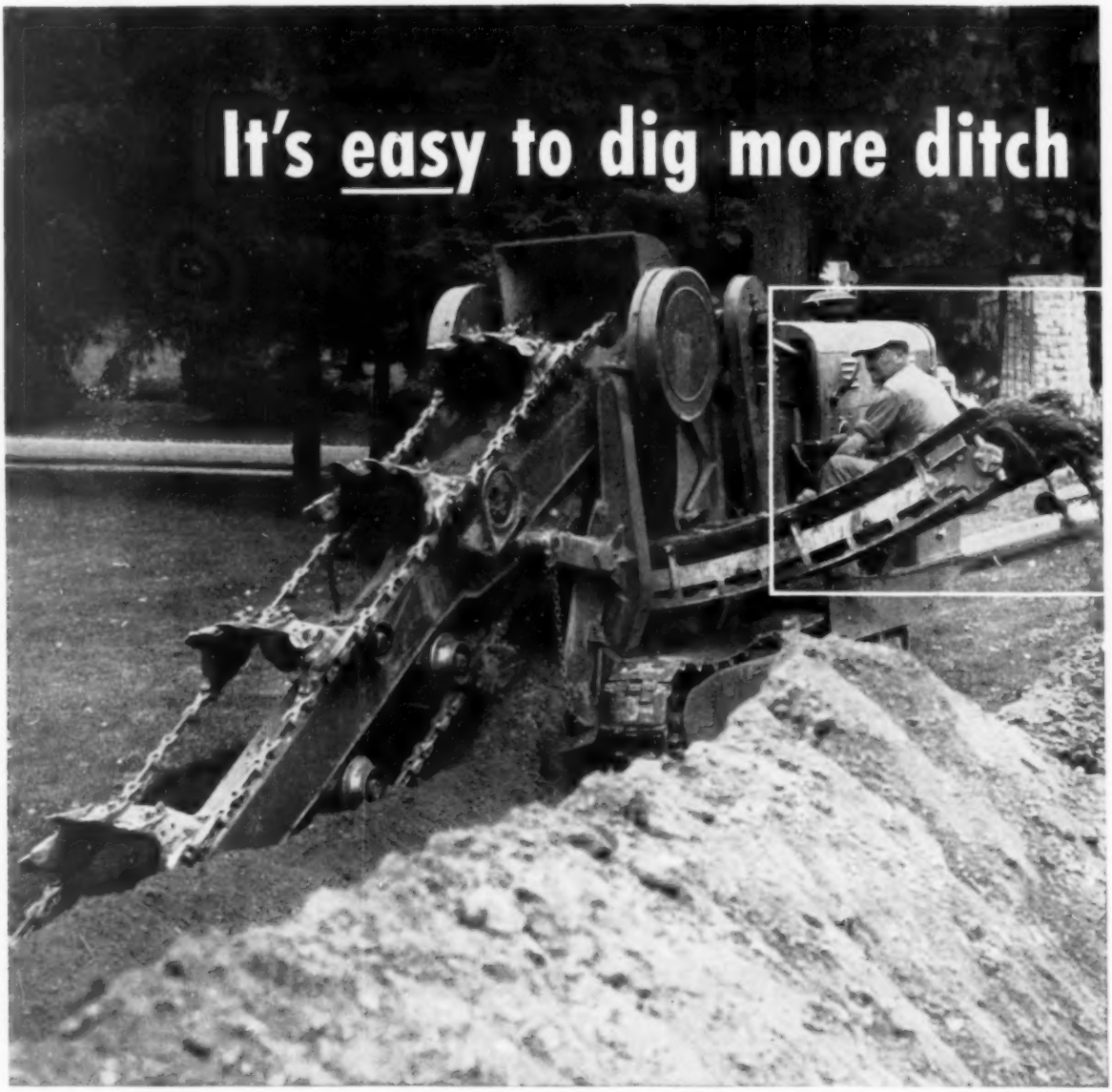
UNITS of County Concrete, Inc., Newtown, Ohio, roll on such tires as the BFG *all-nylon* All-Purpose. All replacements are BFG.

Specify B. F. Goodrich tires when ordering new equipment

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

Your B. F. Goodrich retailer is listed under Tires in the Yellow Pages of your phone book

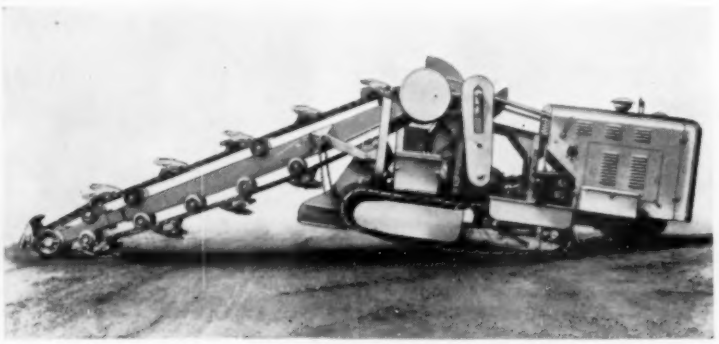
. . . for more details circle 220, page 16



The Gar Wood-Buckeye 407 ditcher digs a full 10 feet deep, from 17 to 24 inches wide.

LIVE HYDRAULIC BOOM WITH POSITIVE DOWN-PRESSURE

The rugged boom on the 407 is raised, lowered and held by an independent, hydraulic control system. Positioning is fast and positive. Double-acting hydraulic cylinders provide full crowd. Illustration shows that down pressure of boom is sufficient to raise machine off ground!



with a Gar Wood Buckeye 407

Put yourself in the seat and see the difference . . .

SPEEDS YOU CAN FIND and use! One selector lever plus high-low range lever makes changing speeds easy. No complicated diagrams to figure out!

INDEPENDENT LEVER STEERING is exceptionally easy, positive and reliable. Each crawler has a separate clutch and brake . . . no tendency to wander!

PUSH BUTTON CONVEYOR SHIFT speeds work around obstructions. Just push the button to shift conveyor electrically while digging . . . no need to stop machine or leave seat.

INSTANT BOOM CONTROL, with live hydraulic action, makes it easy to maintain grade, clear underground obstructions. One convenient lever does it!

Fast, accurate adjustment for changing conditions saves time, boosts production

The 407 is far easier to operate, control and adjust than any other ditcher in its class. Here's why:

Streamlined and compact, the 407 has the smallest practical dimensions for the widest range of applications. Lowest overall height, 7 feet 3½ inches, for easy transport without disassembly. It's exceptionally maneuverable in close quarters . . . digs neat, clean ditch right up to walls and foundations. Also digs in reverse for tunnelling and undercutting.

Correct balance . . . light weight . . . low center of gravity . . . excellent weight distribution add up to greater stability on any grade. Rugged crawlers provide maximum traction and minimum ground pressure.

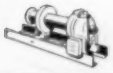
The Gar Wood-Buckeye 407 is the world's largest selling ladder-type ditcher! Find out why. Call your Gar Wood-Buckeye dealer or write: Customer Service Department, Gar Wood Industries, Inc., Wayne, Michigan.

GAR WOOD INDUSTRIES, INC.

Wayne, Michigan • Findlay, Ohio

Plants in Wayne and Ypsilanti, Mich.; Findlay, Ohio; Mattoon, Ill.; Richmond, Calif.

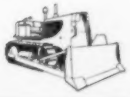
Gar Wood Truck Cranes



Gar Wood Winches

Gar Wood-Buckeye Ditchers

Gar Wood-Buckeye Finegraders



Gar Wood Tractor Equipment

Gar Wood-St.Paul Hoists & Bodies

. . . for more details circle 214, page 16

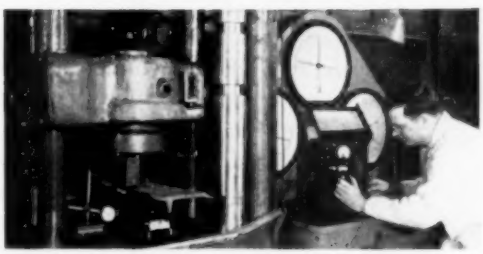
Biggest reason for using only Caterpillar original parts in your machine is a reason you cannot see or feel. It is the *ancestry* of Caterpillar parts.

Behind each and every CAT* replacement part is the experienced engineering, painstaking research, grueling testing, skilled manufacturing and rigid inspecting which make Caterpillar products the standard of the industry. With these truly "pedigreed" parts you can be sure of better all-around performance, less down time.

With substitute parts, can you be sure of anything?

See your dealer's Parts Representative — get Caterpillar original parts every time.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.



Special gauge measures exact amount of strain a track shoe part can endure. Constant testing like this guarantees that all parts are made to the highest Caterpillar standards. Why be satisfied with anything less?

CATERPILLAR*

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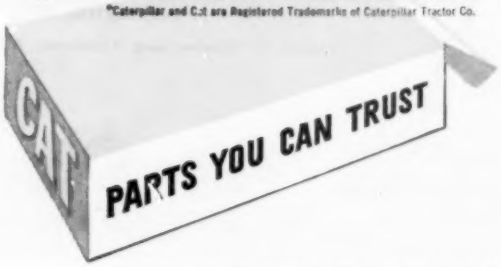

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SPECIAL-DOZER FED LOADER EATS UP Big Granular Cut

Most of the 600,000 cubic yards of excavation required for section of Spokane Freeway was handled by a contractor-built belt unit, designed to permit high-speed dozer feeding of loose granular materials into trucks and bottom-dumps.

WHEN the new grade for a 4-lane-divided freeway requires making a long 12 to 30 ft. deep cut through loose, bouldery granular material, what is the best way to move that material with a long haul?

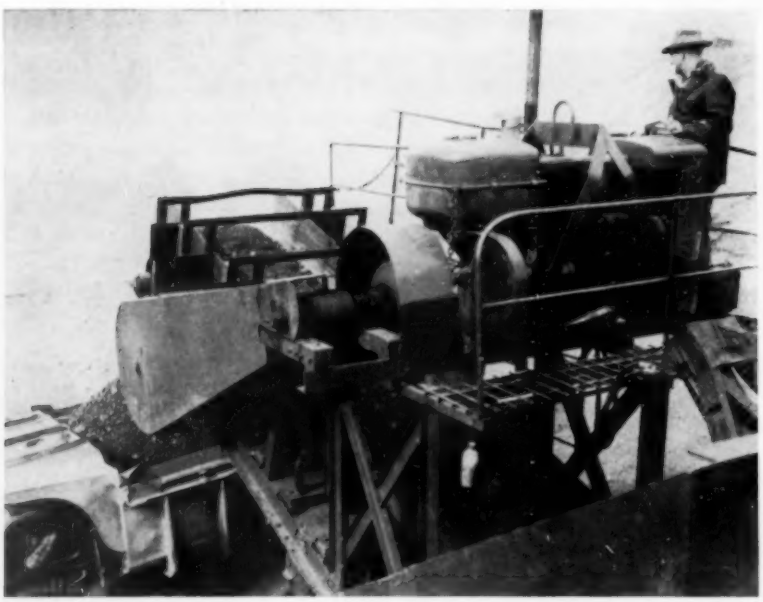
The answer for such a job just outside Spokane, Washington, during 1955, was to devise the special loader pictured. The contractor, N. A. Degerstrom Co., of Spokane, using this loader in the progressively retreating face of the cut, took out some 600,000 cu. yd. of material.

The material which made the method possible consists of a sandy gravel with large boulders intermixed, topped with about 2 ft. of overburden. For contract purposes the material was classified as common excavation. The job also included 5,000 cu. yd. of rock excavation, removal of which entailed no special problem.

The opportunity for high-speed excavation of loose material led the contractor to devise the special unit, which consists of a 48-in. by 60-ft. belt conveyor, mounted in a frame along with a hopper. The unit was

● General view of highway cut, showing location of belt conveyor. About 300,000 cu. yd. of material had been removed at this point.

● A 23-yd. load in 50-seconds sends Euclid wagon on its way.



designed to fit into a slot in the sloping face of the workings. The belt was powered by a Case 65 hp gasoline motor.

The procedure was to establish a transverse working face the full width of the roadway cut, with the loader spotted about midpoint. Two heavy bulldozers, consisting of a Caterpillar D9 and an International TD24, then shoved material toward and into the hopper, working in radially from each side of the cut. Normal production thus achieved was about one-half cubic yard per second — a Euclid 23-yd. bottom-dump was filled in about 50 seconds. Dozers worked at various levels to get the cut completed, utilizing a downhill path whenever possible.

Hauling was done with an assortment of units, dictated somewhat by the fact that ramps for a bridge ap-

● Case 65 hp industrial engine drives belt conveyor, 48 in. wide by 60 ft. long.

proach were being built along with highway fill sections. The equipment consisted of intermixed bottom-dumps, rubber-tired scraper units, and trucks. There was practically no waiting at the loader, so rapidly and steadily did the dozers push material into the hopper.

The sand and gravel material making up the bulk of the excavation was blended with the topsoil by the bulldozer operators, who showed considerable skill at this operation.

● *Method of Rolling.* The material was hauled an average of about 2.5 miles, of which 1.6 miles was over a previously graded freeway section. Fill specifications required placement in 8 in. compacted layers, going to 4-in. layers in the upper 2 ft. of embankment. The upper 2 ft. was compacted to 95% density as measured by the AASHO standard method of test. Maximum density for this job was approximately 136 lb. per cu. ft.

Rolling for the 8-in. lifts was accomplished usually with three passes of a Hyster grid roller and a Tampo 50-ton rubber-tired compactor, the latter unit being towed by a Caterpillar D8 tractor. More passes were required only where boulders were not pushed down below the surface of the lift in the three passes, as found desirable to help maintain good hauling conditions.

The grid roller, towed by a Caterpillar D7, was a 30,000-lb. unit with 57-in. diameter drums each 32 in. wide, with ballast added to bring the gross weight to 44,300 lb. This roller with 3½-in. grid openings was successful in pushing the boulder stones under while leaving a carpet of smaller sized stone on the surface, making for good hauling conditions for bringing in the next lift.

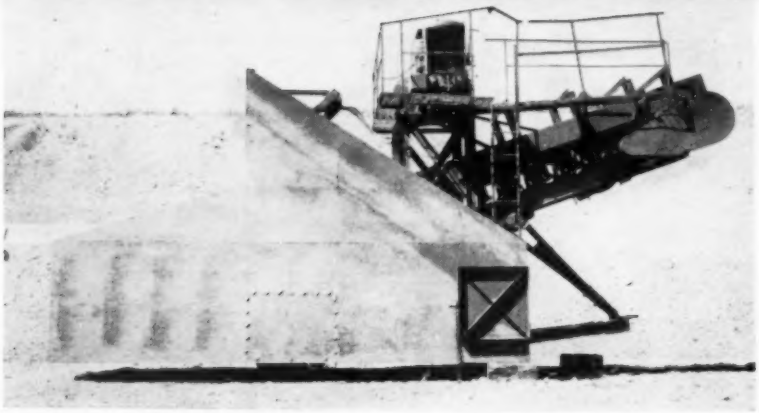
● Hyster 15-ton grid roller with 7 tons of ballast compacted the fills and pushed boulders below the surface.

● State inspector Ray Jones (right) taking volume reading for density test with Washington state "densometer." "Tex" Brewer, contractor's superintendent, lends a hand.

Densities on the fill, taken as the layers were complete, were determined by using the recently developed Washington state highway densometer. This new tool, devised by an employee of the state highway department, quickly and accurately determines the volume of the hole which is dug in making the density test. Results obtained so far have run between 99% and 108% of maximum.

Another outstanding feature of this

● Caterpillar D9 and International TD-24 bulldozers feeding hopper of belt conveyor, which is loading a 10-yd. International dump truck. Loading time, 25 seconds.



● Close-up of the belt loader taken while en route for new operating set-up every 250 ft. along the highway centerline.

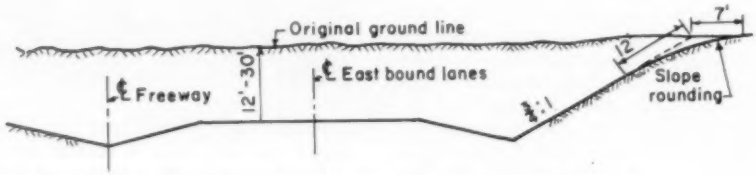
project is the design for handling storm run-off and snow melt run-off. Since the subsurface material of the area consists of gravel and small boulders, and since the water table lies 40 ft to 60 ft. below, dry wells were adopted for discharge of drainage. The 3 in. in diameter wells consisted of standard reinforced concrete pipe in which holes have been drilled. Pipe was carried down 12 ft. below ditch bottom and supported on a concrete base 48 in. in diameter and 6 in. thick. The two upper 4-ft. pipe lengths, only, were perforated with 1-in. holes on 6-in. centers over the pipe surface.

The well holes were dug with a clamshell bucket and the Northwest crane. They were placed in the ditch lines where necessary and in the center of the freeway 40-ft median strip. Standard catch basin tops were installed on the top of the pipe.

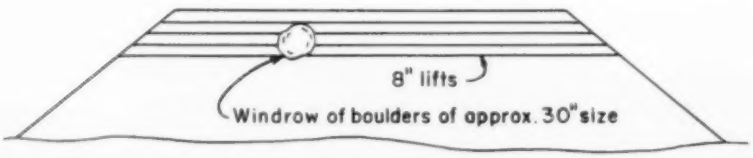
● *Equipment.* N. A. Degerstrom Company has used the following major equipment units on the job:

1 Belt loader, 48 in. by 60 ft. (Built by contractor, powered by Case industrial engine).
1 Caterpillar D9 with bulldozer.
2 Caterpillar D8's with bulldozers.
1 International TD-24 tractor with bulldozer.
1 Caterpillar D7 crawler tractor.
1 Traxcavator HT4.
3 Euclid 13-yd. bottom dump wagons.
3 International 10-yd. dump trucks.
2 Caterpillar 12 motor graders.
1 Northwest 25 truck crane.
1 Hyster 15-ton model GC grid roller with 7-ton ballast.
1 Tampo 50-ton rubber-tired roller.

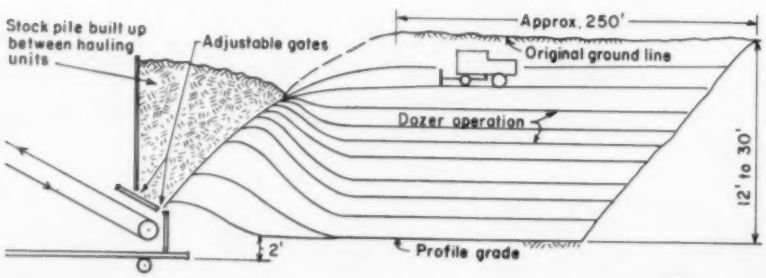
● *Personnel.* The project, now nearing completion of grading, is under the supervision of Roy E. Tillman, district engineer; Rod Ross, construction engineer; R. B. Leary, resident engineer; and Ray Jones, inspector, Washington state highway department. Degerstrom's superintendent is H. (Tex) Brewer.



● Typical cross section of cut showing rounded slopes, dressed by motor grader as cut deepened.



● How boulders over ½-yd. size were windrowed parallel to centerline and enveloped by fill lifts.



● Diagram of typical dozer operation back of the loader.

Supplementary Notes on Loader Operation and Boulder Disposal

The following additional information on the Spokane Freeway project arrived from resident engineer R. B. Leary, just as this issue was going to press.

The unit's gate is hydraulically controlled either to the 36" x 40" maximum opening or any smaller opening desired; a setting of 18" x 40" was found best for general operation, the maximum being used only when necessary to pass boulders.

The loader is mounted on a single axle with dual tires (total of 4 tires). Wings attached low on the frame are swung outward at each set-up, to catch the toe of the cut slope when the loader is in operation. Moving of the unit is accomplished by hooking a tractor to the drawbar and backing the unit into position against the new working cut face. Holes are dug under the tires so that the loader rests on its frame while in use. The drawbar is detached while the machine is working.

The loader has been set up at about 250 ft. intervals along the project centerline. The contractor figured that this length of push with his dozers was the most economical. As the cut was brought down to grade, the intersection of the original ground line and the backslopes were rounded off using motor graders, and the slopes

(Continued on page 104)

EDITORIAL

RESEARCH IN EARTHMOVING

Plans by a reactivated Highway Research Board committee to delve into equipment will be watched with high interest. Particularly the research in aspects of earth embankment construction should be of greatest importance to contractors, specification writers, construction engineers, and equipment manufacturers.

Earthmoving is the largest single part of the highway building job, and its magnitude is spotlighted anew by the proposal to rebuild the interstate network to expressway standards. Some say it will take a $30 billion investment in earthmoving machinery to construct a $100 billion worth of new roads in ten year's time.

Let us note for a moment the role of the grading contractor, who must build what the engineers want or think they want. Under the specifications and tests as they now stand, the contractors have come a long way in developing a peculiar management skill. Weather, soils, rocks, and moisture being such great variables, this skill is essentially an art of improvisation. It must always be that to a great extent. Thanks to the present array of diesel powered tractors, scrapers, motor graders, excavators, hauling wagons, compactors and accessory equipment, the contractor despite high labor rates has kept excavation costs down to 30-year-ago prices, while other highway cost elements have doubled or tripled.

It is against this backdrop of brilliant progress that new research is being planned in soils and equipment utilization. Many questions still need better scientific answers. What happens to a soil structure as a heavy rubber tire passes over it? How should vibration be used in rolling? What is the most economical lift thickness for given conditions? Is there a better, cheaper way to disperse compaction moisture throughout a lift? What is the best type, size and weight of roller, or combination of rollers for given conditions?

On the soils engineering side there is considerable dissatisfaction with some of the present procedures. Many feel that the specification of this or that layer thickness is arbitrary and often wasteful, with much talk of 12 to 18 inch thicknesses as a possibility. Some of the standard tests are questioned. The density tests, for example. More rapid field tests will be a necessity as daily yardage production continues to rise. Maybe some day contractors in all states will have a freer hand to place embankments under results type specifications.

Possibly new research data will get at the very roots of the contractor's job management — how to get the most production at least cost. Despite the advances, most contractors will readily admit that there is plenty of room for improvement in equipment utilization. You still see trucks waiting to load, shovels waiting for wagons, pavers waiting for batches. (Yes, and everybody waiting for the inspector). Time studies by the Bureau's Production Cost Unit have shown, over and over, that the average job can be tightened up substantially. There's a real scarcity of good job managers, and plenty of "research" to be done right in camp.

Why, with all our progress, is there so much dissatisfaction? The answer is that modern technology in roadbuilding, as in aircraft design and any other field today, cannot stand still. The committee under Fred Farrell has a big field to roam. Its work will be part of a profession and industry which we confidently expect will see greater changes in the next ten years than in the past thirty.

Briefly Noted

Among the practical ideas for speeding up highway work and getting more value for the dollar in construction, we can't think of anything more practical than that of awarding contracts plenty early in the year. When contractors can do pre-season getting ready, they can handle their projects more efficiently.

A contractor's over-all efficiency and economy is the end result sought by highway and street engineers and administrators. In the Middle West an open, dry spring often will enable a contractor to breeze through a lot of earthmoving months ahead of time.

The South Dakota highway department is among those doing a good job of getting lettings over with early this year. This department held a big letting January 10, and another one on February 28, the latter including 150 miles of chip sealing, (for which oil companies incidentally were asked to bid on RC cut-back with 3% synthetic rubber added).

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS

Roads and Streets in the News

Early Start Planned for Illinois Toll Road Construction

HAVING the green light in the form of a $415 million bond sale for construction, the Illinois Toll Highway Commission is swinging into action. July 1 has been announced as ground breaking date.

The bonds will finance a $288 billion construction program covering 193 miles, scheduled to be completed and open to traffic by December 31, 1958. Also to be financed from the issue is $52 million of right-of-way acquisition cost, $20 million of engineering cost, the financing charges and interest during construction and the first year of operation which will total $40,000 per day.

The purchase of a 7-mile leg of the county-city built Northwest Highway for about $10,000,000 is part of the plan of action tying the toll road system with Chicago metropolitan expressways.

The policy of the Commission, according to Chief Engineer George L. Jackson, will be to direct the construction program with a minimum staff, leaving the details of planning and over-all coordination to the general consultants, Joseph K. Knoerle of Baltimore, Maryland. This firm will direct the detailed engineering and supervision through section or contracting engineers.

While the section engineers will prepare detailed construction plans and supervise construction, certain aspects such as the erection of signs and markers, and other specialized details of the job, will be handled on an over-all project basis. It is expected also that a soils engineering specialist will be in the picture for parts of the project requiring such attention.

A feature of the management will be a quality control engineer whose task will be to work out procedures to insure first class construction, despite the hurry and pressure for meeting deadlines on the part of both the engineers and the contractors.

According to Mr. Jackson, the Commission expects to devise a basis of payment for consulting engineers which will help them maintain full professional status, while insuring equitable fees.

Construction contracts, Mr. Jackson told the Illinois Road Builders Association at a recent conference, are to be handled as "package" contracts, each contractor bidding on a complete section of highway including grading, drainage, paving and structures. Bids will be received on single sections or two or three adjoining sections in combination, with the possibility of awarding two or three sections as a single contract where advantageous.

The construction will be on a 30-month basis, reaching a peak of $12 to $15 million per month payment to contractors when the program gets in full swing.

A problem with the road has been the right-of-way acquisition. The Commission claims to have prepared the most complete cost estimates in the history of such acquisition work, covering 4,000 separate parcels of real estate involved. Illinois right-of-way law is not a "quick" law but requires condemnation proceedings, judgment entered by a lower court, bond posted in 10 days, etc. The Commission expects, however, to establish a good rate of speed in the acquisition. The Attorney-General of the State of Illinois will be responsible for acquisition of property.

The highway design will be unusual in that the inner lane on two-lane pavement will be 13 ft., giving a 25 ft. over-all pavement width. The middle lane of 3-lane construction will be 13 ft., giving 37 ft. over-all width. The highway will have paved shoulders.

In line with recommendations, based on an engineering report, portland cement concrete has been chosen as the pavement throughout the 193 mile system. The Commission, however, is watching the cement shortage situation and is prepared, if necessary, to consider alternate types for some part of the mileage.

Prequalification of bidders will be required under a procedure which has not been standardized. Contractors taking jobs will be expected to do at least 50 percent of their work, to avoid "brokerage" type handling. The state hopes to capitalize on the extensive toll road experience gained by many Illinois contractors working on projects throughout the country.

The engineering work will be pushed, offsetting the scarcity of engineering personnel by using every feasible short-cut of design, field survey and planned preparation. Standard designs are being developed which utilize precast standardized units for structures. In general, the Illinois Division of Highways specifications will be used as a basis for the toll road work, with modifications deemed desirable.

Mr. Jackson briefly mentioned the types of toll collection facilities plan-

New Highway Laws In 1955

A summary of laws affecting highway department administration passed by state legislatures in 1955 has been compiled by the National Highway Users Conference.

According to the report:

- Six states, which did not previously have a controlled-access law covering the entire state, enacted comprehensive laws in 1955 — Georgia, Montana, Iowa, Nevada, Tennessee, and Vermont.
- Ten states broadened their existing control of access laws — Colorado, Illinois, Indiana, Louisiana, Nebraska, New Hampshire, Washington, West Virginia, Wisconsin and Wyoming.
- Eight states improved methods of obtaining right of way for construction.
- Six states passed laws providing for classification and mileages of various highway systems.

ned. The portions of the highway near and north of Chicago will have barrier type toll plazas with 25 cent charges at six intervals in an 80-mile distance. Off-road toll gates will be provided at interchanges elsewhere.

Expressway program for Philadelphia area

Another 163 miles of limited-access expressways has been added to the program for the Delaware Valley and Philadelphia area, bringing to $1,250,000,000 the ultimate estimated cost of a 25-year program.

Perhaps the most imaginative and daring regional program of its kind in the country, this one is the brainchild of the Delaware Valley Council, a tri-state regional planning and development agency. The Council's aim is for 33 expressway routes covering 637 miles in the 11-county region on both sides of the Delaware River. The recently amended plan is timed to tie in with Congressional action on the Federal highway program with its expected emphasis on highway type facilities in heavily populated areas.

South Carolina begins record road building year

Typical of the outlook in nearly every state, the one in South Carolina is for a record road construction year with $30,000,000 scheduled for roads and bridges. This compares to $24,000,000 of construction placed under contract in 1955, this figure taking in approximately $8,000,000 for ordinary and heavy maintenance, retreatment of worn pavements, and shoulder treatment.

The highway department announces for 1956, that its work will be focused on primary roads where traffic is heavy, representing a shift from the past year when secondary roads received heavy consideration.

Diversion continues high

The diversion of state highway use tax revenues to non highway purposes amounted to $269,452,000 in 1954, according to data recently released by the Bureau of Public Roads. This is a decrease from the $294,076,000 diverted in 1953 but still the second highest year on record.

In 1954, some 7.4 cents of every dollar available for distribution from state imposts on highway users was diverted. In 1953, the figure was 8.6 cents. Diversions in one state ran 44 cents of the dollar.

Tri-state turnpike shelved

A two year delay is in prospect for the proposed Tri-State toll road across West Virginia, Virginia and North Carolina. A survey of the traffic potential for the proposed 356-mile highway was ordered suspended, following a review by the chairman of the respective turnpike agencies involved.

An adverse report had been rendered by the engineers, Coverdale and Colpitts. The depressed price of West Virginia Turnpike bonds, together with the uncertainties due to possible federal highway legislation for important arterials in the region, were said to be factors in this decision.

Financing delayed on Connecticut Turnpike

The Connecticut Turnpike, the 129-mile expressway from Greenwich to Killingly, will not immediately receive additional money from bond sales. A $100,000,000 issue scheduled for December sale has been postponed indefinitely, "due to the unfavorable conditions of the tax-exempt bond market at the present time." One $100,000,000 bond sale took place in May of 1954 for this $398,000,000 project, parts of which are now in the construction stage.

● *Indiana 2nd Toll Road.* Governor Craig announced that plans for financing Indiana's projected north-south toll road are attracting wide interest among the nation's investment bankers. Officials of Lehman Brothers, New York, report that 467 bond underwriting firms had applied for financing participation.

If engineering surveys indicate feasibility, $175,000,000 to $200,000,000 in bonds are expected to be offered some time after April 1. The route being studied would connect the Calumet area terminus of the $286,000,000 northern Indiana turnpike, now under construction, with a point about 14 miles east of Indianapolis.

● *Indiana Matching Trouble.* The Indiana state budget director has told the Indiana Commission on Tax and Financing Policy that the state's gasoline tax rate will have to be increased to meet future highway needs. Indiana will fall $70,000,000 short of matching federal funds in the next biennium unless the gas tax is raised above the present 4-cent rate. State highway officials have estimated $1,000,000,000 is needed to bring Indiana roads up to adequate standards.

● *Philadelphia Area.* The Philadelphia Mayor's Urban Traffic and Transportation Board released a report estimating that road construction costing a total of $1,600,000,000 during the next quarter century will be needed to meet the traffic problems of the eight-county Philadelphia area.

● Newly opened Maine Turnpike extension as seen late in 1955 just prior to opening.

Heaping load on the bulldozer is easily handled by the Turbocharged D9. Notice all-around visibility from operator's seat—also easy access to controls.

D9 SETS PRODUCTION PACE CROSSING ON SECTION 33, MASSACHUSETTS

A bid of $4,719,719 on Section 33, Massachusetts Turnpike, won the contract for J. F. White Contr. Co., Cambridge, and Consolidated Constr. Co., Attleboro, Mass. Among other work, specifications on this 3.89-mile section called for excavating 1,720,000 cu. yd. of earth, 46,100 of rock and 231,800 of peat, as well as handling 507,800 cu. yd. of borrow and 205,000 of gravel.

In the equipment line-up, there was a fleet of Caterpillar units including a D9, four D8s, two No. 90s, one D6, four DW21s, a No. 12, a No. 212, a D337 and two D13000s in draglines. Here you see the Turbocharged CAT* D9 Tractor with No. 9S Bulldozer pushing fill into a peat bog.

On this well-planned operation, seven scrapers hauled the fill to the D9. Making round trips of about 4500 feet, the wheel-type DW21-No. 21 Scrapers averaged 15.4 pay yards a trip. On shorter hauls, the crawler-drawn No. 90s averaged 22 pay yards a trip. During its 10-hour day, the D9 set such a fast pace for the scrapers that only occasionally was it necessary to have another 'dozer lend a hand with the fill.

For jobs that call for top production, you can't beat the dirt-moving capacity of the giant D9. For complete facts about the new king of the crawlers, see your nearby Caterpillar Dealer!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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THE D9—NEW KING OF THE CRAWLERS

PEAT BOG TURNPIKE

BIG PRODUCTION FEATURES OF THE D9

First Track-Type Tractor with Turbocharger

The D9's Turbocharger is driven by engine exhaust, utilizing energy which would otherwise be lost. It packs air into the engine according to engine load, *not engine speed, for* more *working horsepower.*

Choice of Torque Converter or Direct Drive

To match the tractor to your job, two types of drive are available: the exclusive Caterpillar Oil Clutch with six-speed transmission (both in forward and reverse) or *a three-stage torque converter with three gear ranges.*

Completely New 286 HP Engine

The powerful D9 Engine features, in addition to the Turbocharger, a 6¼" bore and 8" stroke and runs at 1200 RPM.

Constant Power Drive for Rear-Mounted Equipment

Power for cable controls, direct from the engine's rear power take-off, makes operation completely independent of flywheel clutch or torque converter, boosts operating efficiency.

Easy to Operate

Hydraulic boosters provide power for steering and braking and master clutch operation. The 7-roller track frame provides excellent stability, flotation and ride. The starting engine has an electric starting system and simple single-lever control for easy and convenient operation from the seat. Fast, sure starts in any weather.

Easy to Service

Oil clutch, torque converter, transmission and steering clutches can each *be removed individually without disturbing other components. Hydraulic track adjusters are among the many other features for fast, easy adjustment.*

Almost singlehanded, the D9 handles all the fill brought up by seven scrapers on Section 33, Massachusetts Turnpike, near Framingham.

Back of the D9, a dragline powered by a Cat D337 Engine scoops peat from bog.

● Present at New York convention for the AASHO-AGC Joint Cooperative Committee: A. C. Clark, Bureau of Public Roads (highway); Edward R. Earl, Portland, Ore. (contractor); J. J. Corbett, Missouri (highway); Walter McKendrick, Jr., Delaware (highway); Rex M. Whitton (pres. AASHO); John Volpe, Massachusetts (highway); Ralph Bartelsmeyer, Illinois (highway); J. L. Ewell, Miami (contractor); F. W. Heldenfels, Jr., Corpus Christi (contractor); W. A. Warrick, Pennsylvania (highway); A. E. Johnson (exec. dir. AASHO); Warren M. Creamer, Connecticut (highway.)

AGC Contractors Condemn "Escalators"

Concern over uncertain delivery prices of steel and cement, one of many topics at annual convention in New York City. Highway contractors begin "grass roots" campaign on highway program.

Roads and Streets Staff Report

THE need for firm quotations on cement and steel was one of the subjects aired by highway contractors attending the 37th annual convention of the Associated General Contractors of America. Held in New York City, January 13-16, the convention drew 1,500 contractors, association executives and visitors representing AGC's 6,500 member firms.

The subject of escalator prices from suppliers and what to do about them, while not on the formal program, took up a considerable part of the AGC Highway Division's Wednesday morning session. A Texas delegate started it off by pointing to the growing seriousness of the escalator price problem. While most suppliers of items other than cement and steel are quite willing to quote firm prices, these two industries have never budged from this practice since the war years.

● The lead time on jobs is getting longer as projects are growing in size, and the sums tied up in escalators have come to represent a serious risk.

The Texas spokesman cited certain Texas cement mills which have come over on the contractor's side, and who are now quoting firm prices. He named these mills, and urged the contractors to swing their patronage to them whenever possible to show their appreciation.

"Why should the cement and steel manufacturers, with their large scale facilities, be unable or unwilling to esimate their own cost trends a year ahead, and quote firm prices?" this speaker reasoned. They'll do so readily when a state highway department buys steel for delivery to the contractor, another delegate observed. This is done in some states where firm prices are required by law in state purchasing. Contractors, this speaker said, should let the suppliers know how they feel in the escalator matter.

Another delegate noted that contractors today need a crystal ball to guess what their prices will be when delivery time rolls around. He characterized the uncertainty thus caused as contributing to inflation of bids, and therefore to unnecessarily high road costs. Still another voice was heard on the difficulty of getting a guarantee of steel delivery at any price in these "seller's market" days.

● This trend of discussion led to a review of broad association policy in the matter of escalators. Past president Dwight W. Winkelman reminded the audience that AGC had repeatedly gone on record against escalator prices from suppliers on jobs where prices had to be firm. The policy of the association has been not to seek escalators in bids but for contractors to prefer firms bidding as professional risk takers on government work.

The mills have had various reasons for resisting change, one being their voiced fear of a price freeze in event of some unforeseen national emergency. A campaign among mill owners would require unified support of the AGC membership, and that it would be helpful to have endorsement

by highway officials as moral support. Intention was expressed to take the matter up with AASHO when its leaders meet on policy in the 1956 summer. A Bureau of Public Roads spokesman present reminded that the Bureau has always required firm bid prices on federal-aid highway work.

The escalator discussion was closed by a timely suggestion from AGC's retiring president, George C. Koss, who warned that the association should go slow in getting embroiled nationally on such issues as this, at a time when the main problem was to keep an eye on Congressional action on the federal highway program.

● The Highway Division session also covered a dozen other important industry problems. Some of the highlights:

● A. C. Clark, Deputy Commissioner of Public Roads, Washington, D.C., told of the new developments in electronic computor application and other devices that will help speed up the engineer's work and offset the technical manpower shortage as highway programs continue to expand.

● Rex M. Whitton, president of AASHO and chief engineer, Missouri State Highway Department, reviewed our basic story of the need for an expanded highway program. He pointed to the model relationship that has long existed between the Bureau of Public Roads and the states, and urged that this relationship be preserved in the public interest.

● The work of AGC's Highway Contractor Division was reviewed by A. N. Carter, division manager, who told of testimony before congress by AGC leaders and other efforts in behalf of the pending federal legislation. The Division's activities also include the successful and widely popular work of the AGC cooperative committees with AASHO, ASCE, public works, and aviation officials; participation in the association's accident-prevention program; advisory work with government agencies; and assistance with the BPR on revision of specifications.

Frank J. Rooney, Miami;
1956 president of AGC

Lester C. Rogers, Chicago;
1956 v.p. of AGC

Rooney Heads AGC for 1956

Officers and directors elected at AGC's New York Meeting are as follows:

President: Frank J. Rooney, building contractor of Miami, Florida. Succeeding George C. Koss, highway contractor of Des Moines, Iowa.

Vice-President: Lester C. Rogers, Bates & Rogers Construction Corp., Chicago, highway-heavy contractor.

Highway Division: Chairman, Edward O. Earl, San Xavier Rock and Sand Co., Tucson, Ariz.; Vice-chairman, W. Ray Rogers, Rogers Construction Co., Portland, Ore.

Heavy Division: Chairman, William H. De Butts, C. F. Lytle Company, Sioux City, Iowa; F. S. Oldt, of F. S. Oldt Company, Dallas, Texas.

● Grass Roots Campaign. One of the most important developments in this meeting was the report that a nationwide campaign was already in progress to get thousands of citizens to write or wire their congressmen urging immediate enactment of the expanded federal legislation. Suppliers, employees, engineering acquaintances, and friends of people in contracting organizations have already begun to take action.

One speaker noted that in 1955, Congressman Fallon received 40,000 letters and telegrams against the then-pending road bill, and only 40 for it.

Highway contractors are seemingly caught in a dilemma in regard to the legislation shaping up in Congress.

● The Bacon-Davis Provisions which would take from the individual states the matter of determining labor prices on highway work, are contrary to expressed AGC policy and not acceptable to most contractors. But Rex Whitton, in his talk representing the AASHO, warned that many contractors would have to decide whether they wanted a highway program with a few objectionable features or no expanded highway program at all. The labor interests were seen to be too strong for any middle course to be likely.

See page 74 for notes on AGC's accident prevention program.

● AGC Highway Division Officers: A. N. Carter, Manager of division, Washington staff of AGC; W. Ray Rogers, Rogers Construction Co., Portland, Ore., vice-chairman; J. L. Ewell, Ewell Engineering and Construction Co., Lakeland, Fla., retiring chairman; Edward O. Earl, San Xavier Rock and Sand Co., Tucson, Ariz.; J. J. Riley, division ass't. manager, Washington, D.C.

ANOTHER PRESTRESSED CONCRETE PIER

for The Port of New York Authority

General view of pier deck nearing completion. Post-tensioned pile caps 21'-6" on centers are supported on steel H piles. Pier is 323 feet wide x 702 feet long.

Pulling 320-foot length of Roebling strand from barge-mounted reel into pile cap forms. Strand was delivered encased in flexible metal hose and with fittings attached ready for placement in forms.

Tensioning a strand while standing in railroad well. Use of single long-stroke center-hole ram and threaded connections cuts jacking time to minimum.

IT IS INTERESTING to recall that prestressed concrete was specified as an *alternate* to more conventional designs for Pier C. The results of that project were so satisfactory that prestressed concrete alone was specified for the new Pier A at Hoboken, N. J.

Roebling Tensioning Elements were used for pre-tensioning the deck stringers on both piers, and for post-tensioning the pile caps at Pier A. Several factors led to the choice of Roebling Strand Assemblies for the pile caps:

★ Machine fabricated strands permitted larger units and reduced the number of tensioning elements handled on the job;

★ For units exposed to tide action, Galvanized Strand Assemblies provided corrosion resistance while curing and minimized friction while tensioning.

★ 320-ft. assemblies complete with metal hose and fittings could be pulled into the forms (with stirrups in place) in 15 minutes;

★ Quick and easy tensioning with a standard center hole ram and threaded connections permitted supervision by regular personnel without need for specialists.

Precast stringers on the new pier, 5 ft. wide x 1 ft. deep and spanning between pile caps 21'–6" on centers, were pretensioned with over 400 miles of Roebling ⅜" 7-wire Uncoated Stress-Relieved Prestressed Concrete Strand.

Linear prestressing in America was initiated by Roebling. In fact, after two years of development and tests, Roebling assumed the role of "guinea pig" in 1946 and placed a prestressed concrete floor in its new Chicago warehouse.

Today, as the result of continuous development and participation in all types of prestressed projects, Roebling is the foremost supplier of tensioning materials in the industry. Why not ask the most dependable source for suggestions and advice on specific applications? Write Construction Materials Division, John A. Roebling's Sons Corporation, Trenton 2, N. J.

Pier A was designed by Parsons, Brinckerhoff, Hall and Macdonald for The Port of New York Authority. Erection including stringer fabrication, by J. Rich Steers, Incorporated.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation CF&I

. . . for more details circle 280, page 16

Colorado maintenance workers get awards

Red Cross certificates of merit for life-saving were presented by Colorado's Governor McNichols to two state highway maintenance employees who saved the life of a co-worker in August of 1955.

The recipients, foreman Theodore Dortch and Patrolman James R. Venrick, pulled maintenance worker Carl A. King out of a roadside water hole and revived him. The water was from summer cloudbursts.

King had fallen in while building up the highway embankment with a front end loader which overturned. Dortch and Venrick rushed in with a motor grader, lashed a cable from it to King's vehicle, and pulled it away from him. But he was stuck in mud and five feet of water, whereupon the rescuers pulled him up the slippery embankment and applied artificial respiration.

● Paving approach at New Jersey end of new third tube of Lincoln Tunnel, linking Weehawken and Manhattan. Second course of portland cement concrete has been struck off and vibrated (see middle foreground) and workmen are hand finishing newly poured slab. In immediate foreground, first course of concrete has been poured and 6x12-4/8 welded wire fabric reinforcing placed. Grow Construction Company of New York, Contractor. (WRI Photo)

Medial barriers for turnpike

Medial barriers will be built along 100 additional miles of the Pennsylvania Turnpike during 1956-1957, supplementing the 18.4 miles of barriers now in place.

Governor Leader announced also after conferring with Turnpike officials that 100 miles of medial surfacing will be added and the seven Turnpike tunnels will be equipped with new lighting and new wall and ceiling surfaces.

$87 million road plan for Chicago area

A 1956 superhighway and road improvement program costing $87,276,000 — largest in history — is announced by Cook County highway officials at Chicago.

As made public by Daniel Ryan, president of the County Board and William J. Mortimer, county highway superintendent, the program allocates $77,864,000 for work on four major superhighways and $9,412,000 for resurfacing and widening 22 miles of streets in Chicago and 38 miles of highways in suburban areas.

Also announced were studies for two major jobs to be done in the area. One is a joint county, city and park district study to take kinks out of Lake Shore Drive near the mouth of the Chicago River. The second study is for the possibility of converting Stony Island, presently a divided highway, into a major connector with Lake Shore Drive at 48th Street.

The $77,864,000 super highway program for the year will be financed from proceeds of initial issues of a $245,000,000 authorized bond issue.

Truck Radio Saves Driver's Life in Mishap

● "If anyone can hear me, come down here quick — I have tipped my truck over." These words over the Motorola radiotelephone saved the life of an injured driver after a logging truck owned by the B.C.K. Company, Inc., of Prineville, Oregon, plunged down a 100-ft. bluff recently with a load of logs.

Next Month

Starting Series On Highway Estimating Methods

In April, ROADS AND STREETS will publish the first of a series of articles on estimating methods for highway contractors, by Geo. E. Deatherage, well-known consultant on construction management. Watch for these articles which will analyse fundamental factors and suggest practical procedures that will help contractors know their true costs in these days of rapid changing methods and conditions.

KNOCKIN' Out the Yardage

Ohio Turnpike project, and it is entirely possible that someone else has equaled or surpassed either our record or that of Villa Contracting Company.

R. E. Holderman
Treasurer
V. N. Holderman & Sons, Inc.
Columbus 11, Ohio

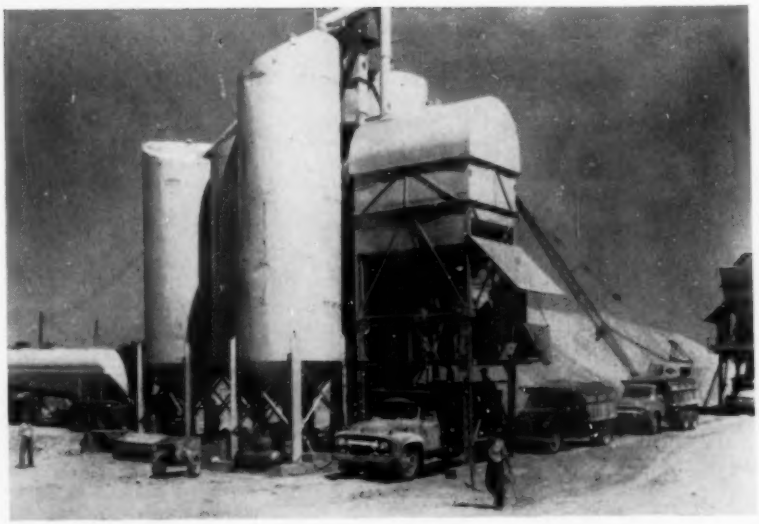
● The Kansas Turnpike was reported 30% completed as of January 1, 1956. The $99.7 million construction program is expected to be completed by late 1956.

To the Editor:

We would like to bring the record up to date with respect to an article published in August 1955 ROADS AND STREETS, pertaining to an apparent paving speed record set by the Villa Contracting Company on the Jersey Parkway. As I understand the article, the Villa Contracting Company paved 7,980 lineal feet of 8″ by 12′ wide concrete pavement in two 9-hour shifts, or a total of 18 hours.

Our best record to date was set on the Dayton-Xenia Expressway project, Greene County, Ohio, on September 1, 1955, on which day we poured 8,193 lineal feet of 9″ by 12′ wide pavement in a single shift of 14½ hours. We are not claiming that this is a world's record, but merely want to clear the record and bring it up to date with respect to our most recent accomplishments.

From time to time during the past year, we have heard various reports of different paving records set on the



● Some of the equipment used by V. N. Holderman & Sons, Inc., in setting what they believe is a new paving speed record. These pictures show the same equipment as previously set up on the Ohio Turnpike during the 1954 season.

New Publications

FEDERAL-AID FOR HIGHWAYS. 24-page illustrated booklet containing maps, charts, etc., explaining what Federal-aid to highways is, how it works, giving design standards, history of Bureau of Public Roads. For free copy, write National Highway Users Conference, 966 National Press Building, Washington 4, D. C.

FEDERAL AID FOR HIGHWAYS. 24-page illustrated booklet describing what federal aid is, how it works. Valuable reference for highway administrators, teachers and students. For free copy, address National Highway Users Conference, National Press Building, Washington, D. C.

THE ENGINEER LOOKS AT HIGHWAY LAW: By Carl E. Fritts, Vice President, Automotive Safety Foundation. Pamphlet covering talk before Legal Affairs Committee at AASHO meeting in New Orleans December, 1955. For free copy, address Automotive Safety Foundation, Ring Building, Washington, D. C.

FACTORS RELATED TO FROST ACTION IN SOILS. The broad perspective of interest in frost action and its associated problems is evident from the seven papers included in this bulletin. By rearranging titles for purposes of this review, it may be seen that it presents an orderly attack on the problem.

The papers present: (1) a terminology now in general use by those most actively studying the problems relating to soil freezing; (2) a discussion of climate and its relation to frost action; (3) detail data on subgrade moisture under different subgrade conditions, the variation in soil moisture varying with changing climatic conditions; (4) a correlation of means for predicting depth of frost penetration with actual measurements; (5) a discussion of a means for measurement of reduced subgrade strengths which follow thawing of frozen soil; (6) a means for better appreciation of agronomic soil groups as they are affected by frost action; (7) a theoretical basis for research.

Price $2.25; address Highway Research Board, Washington 25, D.C.

WHAT PARKING MEANS TO BUSINESS. A 60-page publication which is a landmark in its field, published by the Automotive Safety Foundation, 200 Ring Building, Washington, D. C., contains comprehensive data taken in part from recent studies by a highway research board committee, and made available by the Foundation as a public service. Please address the foundation for a copy of this report.

ENGINEERING DRAWING AND GEOMETRY — by Randolph P. Hoelscher and Clifford H. Springer was published in January by John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. A unified text that emphasizes the application of theory to practical problems, the new book is devoted to the development of engineers rather than draftsmen. (520 pages, 8½x11 in., including 60 tables and more than 1,000 illustrations. Price $8.00).

TIME FOR DECISION ON THE NATION'S HIGHWAYS. A highly pictorial booklet for popular distribution. If interested in helpful data for disseminating on the need for modern highways, address National Highway Users Conference, National Press Building, Washington 4, D. C.

HIGHLIGHTS OF THE WASHO ROAD TEST. A 24-page semi-pictorial summary giving at a few quick glances

the essential findings of the Idaho road test. For copy, address, National Highway Users Conference, National Press Building, Washington, D. C.

PROCEEDINGS, 41ST ANNUAL ROAD SCHOOL, PURDUE UNIVERSITY, 300 pages. Papers compiled and edited by Ben H. Petty, Professor of Highway Engineering. For a copy, address the University Editor, Purdue University, Lafayette, Ind.

ABATEMENT OF HIGHWAY NOISE AND FUMES, Bulletin 110, Highway Research Board, 2101 Constitution Avenue, Washington, D.C. Price 90 cents.

The increase in traffic noise on primary highways and expressways is causing concern among both automotive and highway engineers. The three papers in this bulletin discuss methods for detecting and evaluating noise factors, and suggest various practical means for traffic-noise abatement. Also reported are some preliminary studies on the problem of eliminating toxic gases and unpleasant exhaust fumes.

The paper, "Abatement of Highway Noise with Special Reference to Roadside Design," by Wilbur H. Simonson, is a summary of a special-task-force report giving results of highway-noise studies over the last several years.

The paper, "Motor Vehicle Noise Studies," by D. M. Finch, explains the common characteristics of noise and describes recent tests performed at selected sites along heavy traffic routes in California.

The paper, "Second Report of Special Task Committee on Roadside Design to Reduce Traffic Noise, Dust and Fumes," by Simonson, emphasizes the need to reduce noise at its source through application of tests and controls on vehicles that are major generators of noise.

ARBA Road Show ad material available

Harvey A. Scribner, Chairman of the Road Show Publicity Committee for the 1957 Convention and Road Show, announces that the Committee now has available advertising material which manufacturers and dealers can use to aid in promoting the show. There are small cuts for use in manufacturers' and dealers' advertising, stickers for use on letterheads and other mailing material, envelope stuffers and reprints.

The Committee would like to have manufacturers and dealers take part in the promotion of the Show by using as much of this material as possible. It is free for the asking.

Complete information and samples can be secured from the American Road Builders' Association, World Center Bldg., Washington 6, D. C., or from the Publicity Committee, 155 North Wacker Drive, Chicago 6, Ill.

● Corrugated steel sheet forms on wood falsework, for concrete deck slab at first composite steel-and-concrete bridge using end-welded studs as shear connectors, erected recently at Fort Pierre, S.D.

Stud Shear Connectors Used in

Stud welding a feature of bridge at Fort Pierre, South Dakota. Saving of time in the field, simplification of design, and structural efficiency are reported for this new development being adopted or considered by a number of state highway departments.

THE emergence of stud welding as a major new factor in reinforced concrete construction was highlighted recently with the erection at Fort Pierre, S. D., of the first composite steel-and-concrete bridge using end welded studs as shear connectors.

Less than two years after laboratory tests were begun to secure engineering and design data, this new application of Nelson granular flux-filled studs has already received widespread acceptance among designers, steel fabricators, and contractors. It is being used on other bridges now under construction in South Dakota, Georgia, California and New Jersey. Approval has been given and the Nelson shear stud is now being shown as an alternate on bridges in design in 22 states where composite bridges are used.

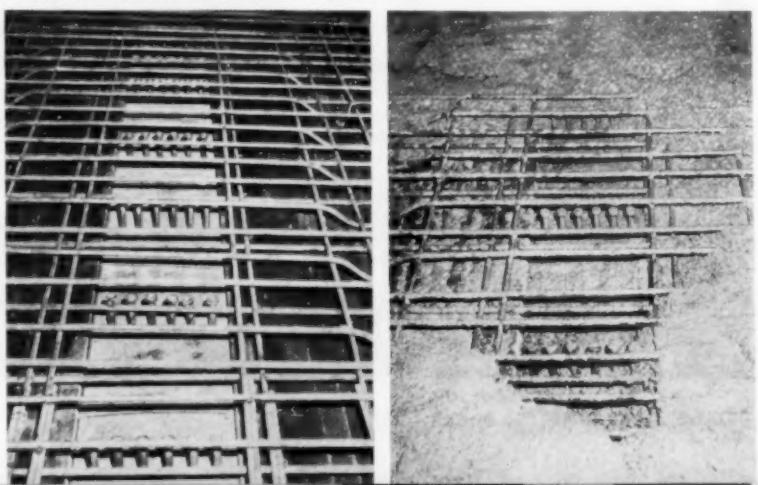
In many instances, studs are being welded in fabricating shops. Because of the portability of the equipment, however this speedy welding method also lends itself to field installation.

In addition to the bridge work, Nelson stud shear connectors were used in the structural framework of the research laboratory recently erected by the International Business Machines Corporation of Poughkeepsie, N. Y.* Several other composite buildings under construction are employing studs as shear connectors.

K. R. Scurr, bridge engineer of the South Dakota Department of Highways, designed the composite bridge erected over the Bad River at Fort Pierre. He pointed out that one of the principal reasons for substituting studs for the steel angles originally specified as shear connectors was the fact that studs permit concrete to be compacted more satisfactorily, so that interaction between the concrete slab and the steel beams is assured.

Scurr also explained that the distortion and warping caused by hand

● Before and after placing concrete, showing how concrete flows readily around the studs, assuring good bond.



*Seelye Stevenson Value and Knecht, Consulting engineers, New York, and Eliot Noyes and Associates, architect, New Canaan, Conn.

● Savings in shop time realized by structural fabricator in using end-welded studs.

● Close-up of studs in place on girder flanges. This method now being shown as a design alternate on bridges in 22 states where composite bridges used.

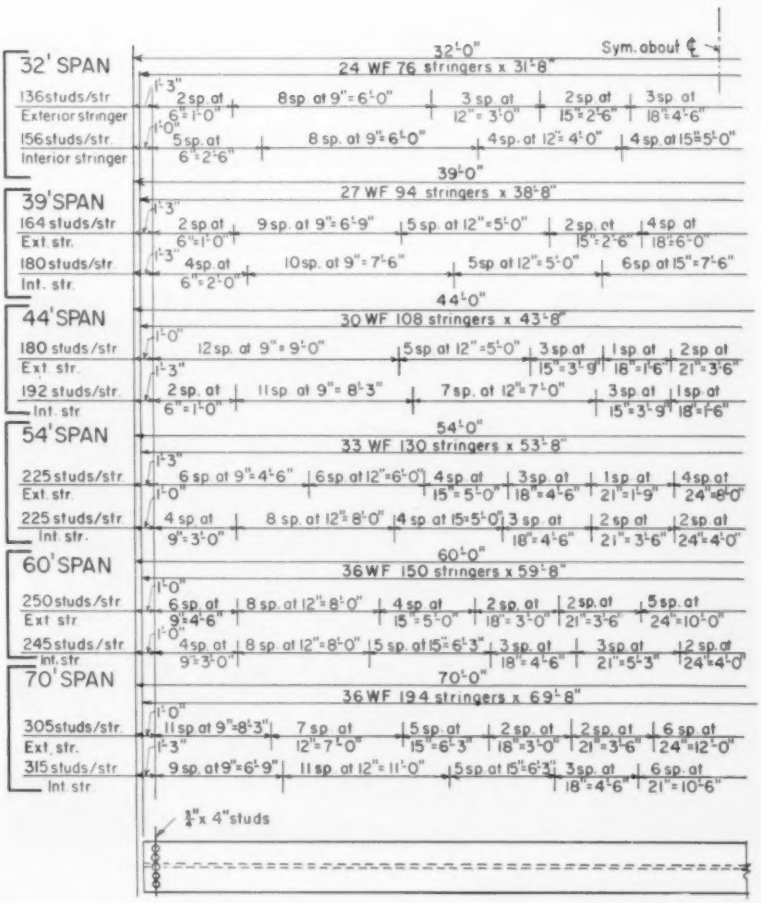
Composite Steel and Concrete Bridge

welding some others types of shear connectors to bridge girders is "absolutely eliminated" with studs.

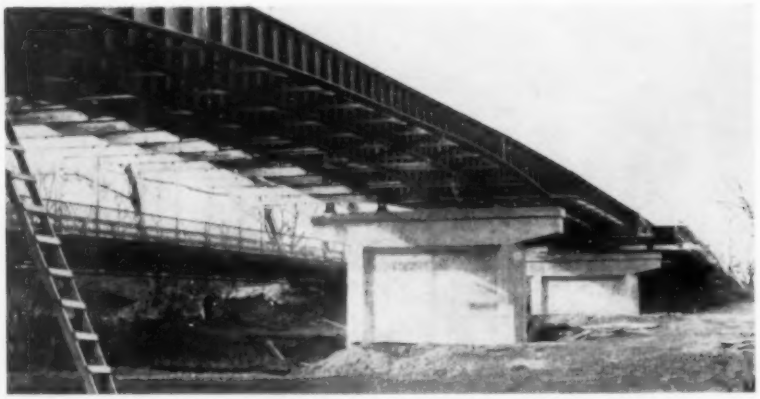
● *Time saved.* According to the fabricator of the beam, the stud shear connectors were end-welded to the flanges of the girders approximately four times faster than the estimated time that would have been required for hand welding other equivalent shear connectors. This work was done by the Egger-Scudder Co. in Sioux Falls, S. D. The beams were then trucked about 200 miles to the job site and were moved into place with only two studs being bent.

Egger-Scudder reported that the shop time was further reduced because of the elimination of the preliminary tack welding, shearing, grinding and other machining often required with shear connectors.

The Fort Pierre bridge is a continuous girder structure of five girders with shear connectors used in the positive moment sections of each girder. These sections are approximately



● Figure 2. Spacing plan for stud shear connectors adopted by South Dakota bridge engineers for various standard girder span lengths. Studs are placed five-in-a-row in top of girder flange, at spacings indicated, the ¾-in. bolts protruding 4 in. and spaced 2 in. apart (2-1/8 in. for 54 ft. span girders).



● The Fort Pierre bridge, showing details of girders used in the composite design.

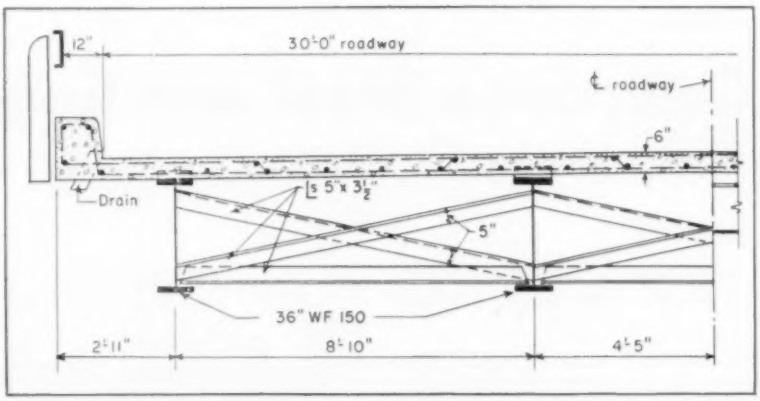
68 ft. long for both end spans and interior spans. The width of the flanges to which the studs are welded is 14 in. A total of 8,300 Nelson granular flux-filled studs, ¾-in. diameter and 4 in. long, with upset heads, were end welded to the girders in lateral rows of six. A Nelson heavy duty NS-9 stud welding gun was used, with a 2,000-ampere Nelwelder generator as the power source.

With the aid of a special wooden loading frame that minimized handling of studs, the operator welded studs at a rate of five to six a minute. Studs were placed in the loading board with six studs in a row in the frame. The operator then merely pressed the gun over a stud in the frame, placed the end of the gun through a ceramic ferrule which had been positioned on the girder, and pressed the gun's trigger. Studs were spaced on 2-in. centers in the rows, and rows were from 12 to 24 in. apart.

After the beams were in place at the bridge site, wooden falsework was erected and corrugated steel sheets, serving as a form for the concrete, were laid over the wood between the girders. The sheets were left in place after the concrete was poured.

● *Design Aid.* "From the standpoint of a bridge designer, Nelson shear connector studs permit a clean design with great flexibility in placement," Scurr said. "The studs may be spaced wherever required, with practically no concern for the location of the transverse slab reinforcement."

The contractor found that the studs were convenient as aids in spacing



● Figure 1. Typical cross-section for 60 ft. girder span (30 ft. roadway), composite, design using angle shear connectors. This plan sheet furnished contractors, along with detail sheet (see Fig. 2.) for their use if they desire to substitute stud shear connectors.

● Heated enclosures were provided during wintertime pouring of concrete slabs for the composite bridge.

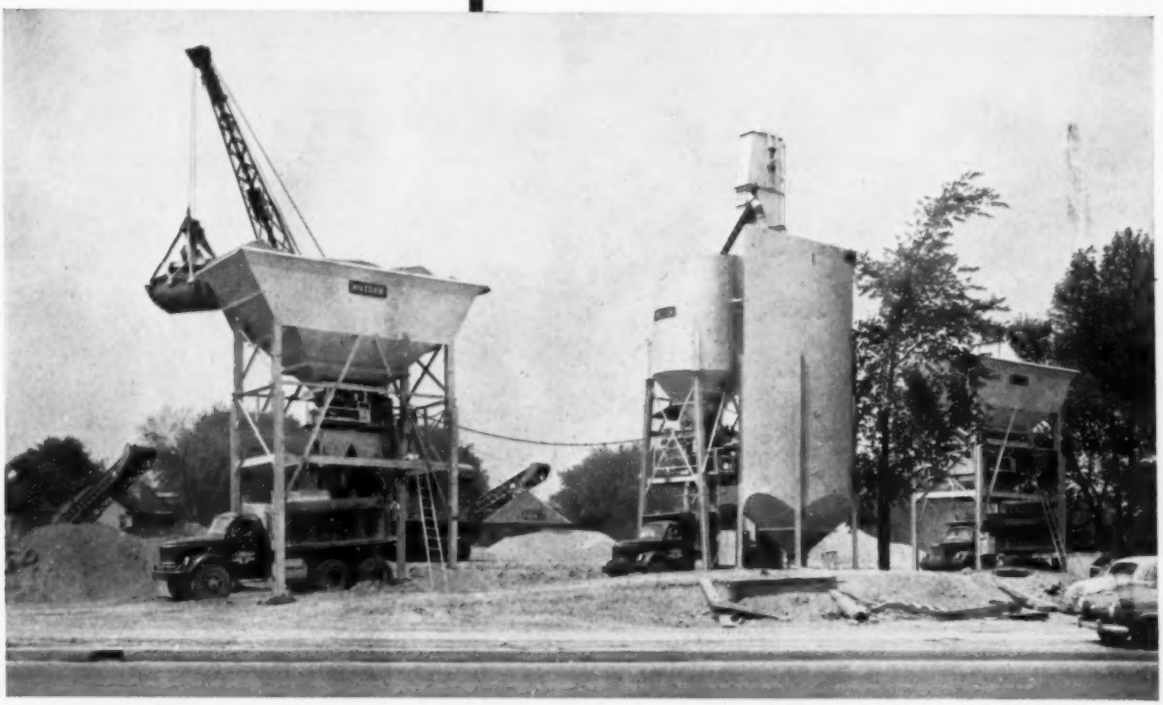
mat for reinforcing bars. He was able to tack weld the spacer bars on the studs and to fabricate his mat in place with positive support to the spacer bars.

The engineering and design data which has led to the wide acceptance of Nelson granular flux-filled studs as shear connectors, were based upon a comprehensive test program of stud welded shear connectors and fatigue tests of bare studs, carried out in 1954 and 1955. The tests, conducted under the direction of Dr. I. M. Viest,* proved the studs were reliable shear connectors and provided necessary design and loading data. On the basis

(Continued on page 113)

*Research Associate Professor, Department of Theoretical and Applied Mechanics, College of Engineering, University of Illinois, which performed basic research work under private contract with the Nelson Stud Welding Division, Gregory Industries, Inc.

SO AUTOMATIC AND INTERLOCKED | this plant could be its own inspector



The BUTLER 0-1-0 Roadbuilders Set-Up

Completely fool-proof, quality control and batching accuracy are *absolute* in the BUTLER 0-1-0. Every batch is the same. Banished are errors caused by operator fatigue.

Master Controls for each batcher are pre-set for any specified batch proportion and are not touched again until the concrete specifications are changed.

ONLY ONE MAN, stationed at the cement batcher, operates a simple set of push-buttons to control batching of *all materials* — sand, cement and 2 sizes of stone.

ONLY ONE INSPECTOR, (instead of three) is needed — and for all practical purposes he and the operator can take turns going fishing. All gates are interlocked so they can't discharge until the correct weight is in the hopper. Nor can the batcher be charged until the previous batch is cleared.

And the BUTLER 0-1-0 is the world's most portable plant. Hours instead of days to erect or dismantle!

It all sums up to this: one man operation and high portability slash costs so drastically that the contractor with a BUTLER 0-1-0 *can bid any job successfully and make a better profit* against competition owning yesterday's equipment.

If preferred, instead of batching all materials from the central station, the truck drivers can batch sand and stone from cab by push button control mounted on bin columns.

Just off the press! A Bulletin completely describing the new automatic BUTLER 0-1-0. Write for it today. We'll send it to you — RUSH!

BUTLER BIN CO.

959 BLACKSTONE AVE.

WAUKESHA, WISCONSIN

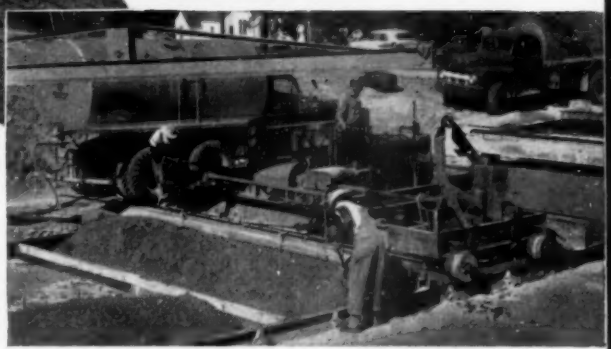
. . . for more details circle 194, page 16

Two Flex-Plane Finishers used in tandom by A. J. Baltes Construction Co., on section of Ohio Turnpike

Western Contracting Co. operated two more on still another section of Ohio pike.

FLEX-PLANE

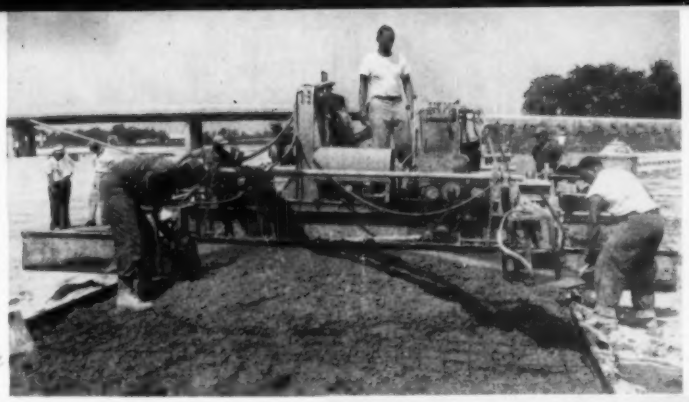
J. C. O'Connor and Sons operate Self-Widening Flex-Plane on section of Indiana Turnpike.



J. A. Tobin uses Flex-Plane working low slump concrete on section of U. S. 69 near Kansas City, Mo.

THE HEINRICH STEEL FORM AND TRUSS — Heinrich — WARREN, O. — THE FLEXIBLE ROAD JOINT MACHINE COMPANY — Flex-Plane — MECHANIZED CONSTRUCTION EQUIPMENT — WARREN, OHIO

WORLD'S LARGEST BUILDER



Self-widening machine used by Peter Kiewit on a midwestern turnpike interchange.

The Flex-Plane machine takes gradework in stride. Here Harrison Construction Co. works cloverleaf with a self-widening unit.

.....the nation's most popular Finishing Machine

9892

Here's the finishing machine that has outsold all others for the past two years. The Flex-Plane has been the most flexible machine of its type ever built . . . and the 1956 model is no exception.

Upon a sturdy triple-lap frame, that extends hydraulically at the flick of a finger, is a power-packed engine that will easily handle the toughest finishing jobs. Users often work them without spreaders.

There is the Flex-Plane originated hydraulic transportation rig that transforms the machine into its own trailer in a matter of seconds. And, the Flex-Plane Self-Widening feature, that proved so popular last year, has been improved for 1956.

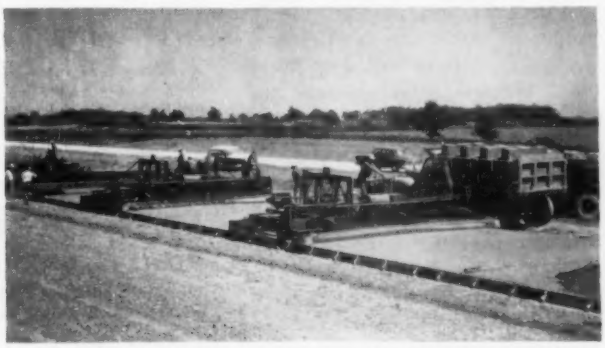
Add to these outstanding features the new Flex-Plane screed that holds rigid and true under any condition, yet takes a crown speedily, with a minimum of down time. Remember, too, Flex-Plane screeds are outside the frame where they belong for easy maintenance and better finishing.

Again we say, look them all over, talk to users, and we're sure you, like dozens of other leading contractors, will specify Flex-Plane Finishers from this point on.

THE FLEXIBLE ROAD JOINT MACHINE COMPANY
6300 Thomas Road Warren, Ohio

While working turnpike Calumet Construction Co. found Flex-Plane flexibility paid dividends.

On Garden State Parkway the Weldon Construction Co. put their second Flex-Plane through its paces.



The Union Building and Construction Corporation uses a pair of Flex-Planes to finish slabwork on Indiana Turnpike.

OF CONCRETE FINISHING EQUIPMENT

. . . for more details circle 210, page 16

when the one is a BUFFALO-SPRINGFIELD 3-AXLE TANDEM *with exclusive* "WALKING BEAM" *compaction control!*

On a recent Maine Turnpike project, *one* Buffalo-Springfield 3-axle tandem WALKING BEAM roller handled the pavement compaction instead of the two that otherwise would have been required.

Several sets of twin finishers laid 2,500 tons of hot mix each 11-hour day. The surface was put down in two 1½" thick courses over a 4" thick compacted stone base. Haul from hot mix plant to paving point was handled by a fleet of 15 trucks.

Without expert planning, traffic conditions would have been chaotic. An aggregate truck rolled up to the plant every 3 to 4 minutes, and asphalt trucks arrived and left almost as frequently.

A remarkable high-speed blacktopping job . . . accomplished on a 'round-the-clock schedule by expert traffic management, several twin finisher set-ups, and using Buffalo-Springfield true WALKING BEAM compaction to complete the job with maximum efficiency in the *fewest* number of passes.

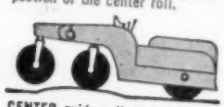
Whether your next compaction job is a *special,* or one on which you must rely on maximum compaction accomplished in the shortest possible time—with fewest passes, and resulting highest profits for yourself—you'll be *sure* of unmatched results with a Buffalo-Springfield WALKING BEAM 3-axle tandem roller!

See your nearest Buffalo-Springfield distributor now. Ask or write for Bulletin No. S-71-1255.

Anything less than a genuine Buffalo-Springfield 3-Axle Tandem with WALKING-BEAM Compaction Control is old-fashioned!

BEAM is in "semi-locked" position. Both guide rolls are suspended from a single pivoting beam. End guide roll can rise above, but not go below its normal position.

FIRST guide roll encounters high spot. Walking Beam permits it to pass over the hump exerting only its normal pressure. This "prepares" material for the high compaction of the center roll.



CENTER guide roll rises on hump. This lifts end guide roll off the ground and transfers its weight, along with some weight of the drive roll, to the center roll which now exerts a compaction effort equal to almost 3 times its normal weight.

DRIVE roll exerts normal compaction as it passes over. All this happens when the Walking Beam is in a "semi-locked" position. When unlocked, it follows surface contours. Fully locked, all three rolls are held rigidly in the same plane.

BUFFALO ROLLER COMPANY — **SPRINGFIELD** — **SPRINGFIELD, OHIO, U. S. A.**

THE LEADER IN COMPACTION EQUIPMENT DESIGN AND MANUFACTURE

. . . for more details circle 193, page 16

3,400 Attend Eventful AED Meeting

Equipment distributors discuss industry problems as its members get set for another record-breaking business year.

LARGEST construction industry gathering since the 1948 Road Show, the 37th annual meeting of the Associated Equipment Distributors was the scene of high optimism. More than 3,400 distributors and manufacturers attended the meeting, held in Chicago, January 29 to February 2. The delegates represented 690 distributor and 309 manufacturing organizations.

Following are some of the highlights:

- The prospective expanded road program was a dominent subject with speakers. The convention voted to urge prompt congressional action, in a resolution which set forth the reasons for the urgency of the program.

- Resolutions were also passed, recommending adoption of the Hoover Commission Report of the sale of surplus property (which recommended use of normal distribution channels for such sale); and urging the Congress reaffirm its stand of 1938-9 on the exemption of retail establishments under the Fair Labor Standards Act.

- Four major business sessions were held, attended by both distributors and manufacturers who discussed mutual industry problems, such as selling methods, salesmen's compensation, territorial allocation, trade-in commissions, disposal of used equipment, parts and personal service to customers, etc.

- A Local Group Clinic was attended by 125 delegates from local distributor organizations throughout the country. Canadian distributors also held their semi-annual meeting during the week.

- The AED voted to hold its next convention in January, 1957, in conjunction with the ARBA convention and Road Show.

- In a presentation ceremony, Morton R. Hunter, Sr., of the Hunter Tractor and Machinery Co., Milwaukee, Wis., an AED founder, was awarded a bronze plaque for his 25 years of loyal Association service.

- AED's Industry Round Table, which has gained importance in its two-year existence, was a convention feature. Co-chairmen Jack Hatten, Hatten Machinery Co., Seattle, Wash., and John Schoen, LeTourneau-Westinghouse, Peoria, Ill., introduced a program fashioned after the court-martial scene from "The Caine Mutiny." In both a serious and humorous vein, "The AED Court of Inquiry" focused attention on important problems affecting distributor-manufacturer relations using both professional actors and Round Table members in the cast. The "court" weighed points to be considered when preparing or accepting a manufacturer-distributor contract.

Distributor members of the Round Table were: J. T. Hatten, Hatten Machinery Company, Seattle, Wash.; H. J. Mayer, Western Machinery Company, San Francisco, Calif.; L. G. Morrissey, Morrissey Bros. Tractor Company, Burlington, Mass.; Jack Myracle, Herd Equipment Company, Oklahoma City, Okla.; J. J. Stockberger, Stockberger Machinery, Inc., Fort Wayne, Ind.; G. W. Gagel, Machinery & Supplies Company, Kansas City, Mo.; and H. W. Hurd, Engineering Sales Service, Inc., Boise, Idaho.

Manufacturer members included: John W. Schoen, LeTourneau-Westinghouse Company; Buel Wallis, Schield Bantam Company, Inc.; V. L. Snow, Euclid Div. of General Motors Corp.; F. J. Whelan, Worthington Corp.; E. H. Holt, Barber-Greene Company; Art Gossard, Iowa Manufacturing Company; and M. B. Garber, The Thew Shovel Company.

Laskey Elected

New AED officers for 1956 were elected as follows:

President: Stanley F. Laskey, of Northwestern Equipment Inc., Fargo, N. D., succeeding Ray J. Finn, of Bode-Finn Co., Cincinnati, Ohio.

Executive Vice-President: L. Miner Doolen, Telford Equipment Co., Lansing, Mich.

Vice-Presidents: H. D. Anderson, Rish Equipment Co., Bluefield, W. Va. (re-elected); F. J. Fitzpatrick, Parker-Danner Co., Hyde Park, Mass.; D. C. Campbell, Tractors and Equipment Ltd., Fredericton, New Brunswick.

Treasurer: J. R. Borchert, Borchert-Ingersoll Co., St. Paul, Minn.

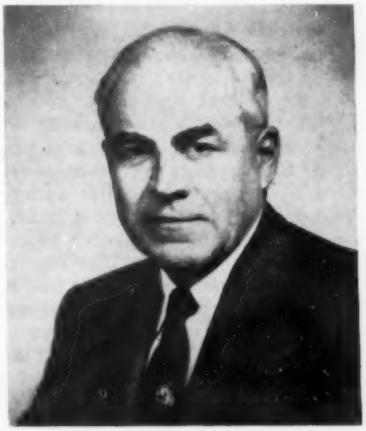
Directors: Leonard Morrissey, Morrisey Bros. Tractor Co., Burlington, Mass.; Harold W. Reilly, Service Supply Corp., Philadelphia, Pa.; Jack F. Davies, Tractor and Equipment Co., Inc., Birmingham, Ala.; John C. Anderson, Anderson Equipment Inc., Omaha, Nebr.; Harold B. Benson, Road Builders Equipment Co., Memphis, Tenn.

Directors (re-elected): John G. Lindner, Jr., Bark River Culvert and Equipment Co., Eau Claire, Wis.; Beal Shaw, Shaw Sales and Service Co., Los Angeles, Calif.

Charles C. Tambornino, George L. Ryan Co., Minneapolis, Minn., was named to a one year term as director of Region VIII, succeeding J. R. Borchert.

Variable tolls suggested for Philadelphia area

In a report on a proposed expressway running twenty-three miles through the suburbs of Philadelphia from Bucks County to the new Delaware River Bridge, the Bureau of Municipal Research and the Economy League of Pennsylvania have presented a new idea in toll road operation.



AED President-elect Stanley F. Laskey

Meetings Ahead

AMERICAN CONGRESS OF SURVEYING AND MAPPING — annual meeting, Shoreham hotel, Washington, D.C,; March 18-24.

WISCONSIN ROAD BUILDER'S ASSOCIATION — 43rd annual meeting, Plankington Hotel, Milwaukee, Wis.; March 19-21.

PURDUE UNIVERSITY — 42nd Annual Road School, Lafayette, Ind.; April 2-5.

EARTHMOVING INDUSTRIES CONFERENCE — Society of Automotive Engineers, Pere Marquette Hotel, Peoria, Ill.; April 3-4.

AMERICAN WELDING SOCIETY — annual spring meeting, Hotel Statler, Buffalo, N. Y.; Week of May 7.

15TH ANNUAL SHORT COURSE ON ROADSIDE DEVELOPMENT — Ohio Department of Highways, Columbia, Ohio; October 2, 3, 4, 5.

Welding society to hold biggest meeting

The most elaborate sessions, ever staged on new developments in the field of welding engineering will highlight the American Welding Society's annual Spring meeting at the Hotel Statler, Buffalo, N. Y., during the week of May 7.

The meeting will be held jointly with the fourth Welding Show at Memorial Auditorium there. The show, too, will break previous records for the number of exhibiting companies and size of displays. Some 111 engineers will contribute 65 papers.

Advance registration cards and hotel information may be obtained by writing the American Welding Society, 33 West 39th St., New York 18, N. Y.

Growing cooperation in accident prevention

Participation of member firms in AGC's accident prevention program jumped in 1955, with 50% more firms reporting their accident records. Ten AGC chapters reported 100% participation of the members. The cooperating firms now total 2,200 or more than one-third of AGC membership, according to H. J. Kirk, association safety director.

The average frequency rate of all firms reporting was 35.6 accidents per million man-hours worked. This compares with 31.14 rate in 1954. The average severity rate, based on the number of days lost per million man-hours worked is 2,856.1 vs. 2,460. The increase in frequency and severity resulted from the increasing number of smaller firms reporting each year.

Twenty-five first-place awards, 18 second-place and 20 third-place awards, divided among chapters and firms with outstanding records, were presented to winners at the association's New York convention. Six hundred no-lost-time awards will be presented later at local chapter ceremonies.

Following are award details for highway and heavy contractors (building awards omitted).

Highway contractor awards: First-place for 1955, Boyle Construction Co., Sumter, S.C., with more than 200,000 man-hours; and the Detroit Concrete Products Corp., Detroit, with less than 200,000. Second-place to Rochester Coal-Trucking and Contracting Co., Rochester, Pa., more than 200,000 man-hours; Porter W. Yett, Portland, Ore., less than 200,000. Third-place to Robert J. Dienst and Son, Columbus, Ohio, and Tye and Wells, Eminence, Ky.

Heavy contractor awards: First-place for 1955, Peter Kiewit Sons' Co., and Condon-Cunningham Co., Omaha, Nebr., which worked over 500,000 man-hours; McAlister-Davis Co., Memphis, less than 500,000. Second-place to Drake-Merritt, Goose Bay, Labrador, Canada; and Weymouth Cnstruction Co., Memphis, Tenn. Third-place to Griffin Construction Co., Inc., Merriam, Kans.; Cisco Construction Co., Portland, Ore.

Five-year safety record awards went to Mott Construction Co., Centerville, Iowa; Sanctis Construction Co., Pittsburgh, Pa.; Diesch Constructors, Waterloo, Iowa; George Carlson Co., Milwaukee; General Paving Construction Co., Grand Rapids, Mich.; Pierson Contracting Co., Saginaw, Mich.; and the James H. McQuade and Sons Co., Pittsburgh, Pa.

Ten-year awards went to George K. Werner and Son, Clay Center, Nebr.; Maxon Construction Co., Inc., Dayton, Ohio; Burrell Construction and Supply Co., New Kensington, Pa.; Walker-Fauber, Inc., Ashland, Ohio; The O'Neil Construction Co., Havre, Mont.; and The Holmes Construction Co., Inc., Wooster, Ohio.

The "100%" cooperating chapters in the campaign were: Michigan Road Builders Association, with over 100 members; Constructors Association of Western Pennsylvania, Kansas City Chapter, and the AGC of West Virginia, Inc., each with between 50 and 100 members; and the Master Builders Association, Inc., of Washington, D.C., Louisville Chapter, Michigan Chapter, Memphis Chapter, Dallas Chapter and the Milwaukee Chapter, all with less than 50 members.

Chapters also winning awards were: AGC of Missouri (second-place), and The Kansas Contractors Association, Inc. (third-place), each with over 100 members. The Detroit Chapter (second-place), and the Ohio Highway Chapter (third-place), each with between 50 and 100 members. The Tacoma Chapter (second place), and the AGC of New Hampshire and Vermont (third-place), each with less than 50 members.

Editor's face Red

We pulled a "beaut" in the February issue — merely by a little thing like the use of the word "uneventful" instead of "eventful" in the following sentence, middle column on page 72:

"● *CIMA Meeting.* The Construction Industry Manufacturers Association, the group which comprises leading U. S. equipment manufacturers and which largely underwrites the parent ARBA, held an eventful meeting at Miami."

Our apologies to all concerned. The irony of it was that this meeting was an extremely significant one, as those who were in attendance were fully aware. — Editors.

Their ideas advocates the use of a variable toll system as a traffic-regulation device. In the variable toll scheme, traffic of economic priority would be assured of rapid movement on the expressway and its feeders at all times. Second priority traffic would be limited during peak hours but encouraged to use the expressway's full capacity during off-peak hours.

The proposed toll system would be simply that of varying the rate of toll with the time of day, week, month, or year or possibly the character of use. It was felt that a high rate of toll at peak traffic periods would discourage relatively unimportant traffic during those periods and encourage it to use the expressway during periods when traffic was not so heavy. The higher tolls would be paid only by the traffic of sufficient economic importance to justify payment of the higher rate. It is hoped that this would result in distribution of traffic more evenly throughout the day, week, month, or year toward a maximum use at all times.

Personals

ROBERT B. MCKEAGNEY has been advanced from district engineer to deputy division engineer by The Asphalt Institute with headquarters at New York. He will aid Herbert Spencer and is expected to succeed Spencer as division engineer on the latter's retirement July 1.

Robert B. McKeagney

VAUGHN MARKER, an asphalt paving specialist with the California Division of Highways, has been appointed district engineer for the Asphalt Institute covering California coastal counties. He will work under B. A. Vallerga, Pacific Coast managing engineer at San Francisco.

C. E. WESTERVELT, JR., has been appointed assistant to the executive director of the Ohio Turnpike Commission, Columbus, as announced by C. W. Hartford, acting executive director. V. O. Robertson is administrative assistant.

FRANK HARWI has been nominated to succeed Walter Rugan as highway director for the Kansas Highway Commission. Harwi, recently deputy highway director, was at one time secretary of the commission.

LOUIS GARAVAGLIA, SR., well known Detroit contractor, died recently after spending more than 40 years in the excavation business. He entered highway work in the early 30's, and was a leader in expressway and road construction in the metropolitan Detroit area.

LYELL C. HALVERSON, of Madsen Construction Co., Minneapolis, was elected president of the Associated General Contractors of Minnesota. He succeeds Ray V. Johnson, Winston Bros. Company, Minneapolis.

THOMAS J. KEEFE died recently at age 64 after long service as an executive consultant of the American Road Builders' Association. He was nationally known in the highway industry and engineering profession, and a long-time personal friend of congressional and other federal government leaders.

Thomas J. Keefe

Proctor President of Consulting Engineer Group

THE AMERICAN INSTITUTE OF CONSULTING ENGINEERS has elected Carlton S. Proctor, of New York, as president, succeeding Francis S. Friel, of Philadelphia. Colonel Proctor, a former president of the American Society of Civil Engineers and a trustee of Princeton University, is a partner in Moran, Proctor, Mueser & Rutledge.

Others selected are Richard Hazen and Robert W. Abbett, both of New York, vice-presidents; Herschel H. Allen, of Baltimore; Ellis E. Paul, of New York, and Maurice R. Scharff, of New York, members of the governing council.

Kansas realigns staff

Several top engineering personnel shifts are announced by the Kansas Highway Commission in a realignment to handle larger programs ahead. Frank Virr has been added as an assistant to Walter Johnson, state highway engineer, being transferred from design chief. He will be in charge of engineering prior to the construction stage. W. S. McDaniel, also assisting Johnson, will have charge of the departments of right-of-way, contracts and proposals, construction and maintenance. The move is designed to free Johnson, top engineering executive, for contact over the State.

H. O. Reed, formerly engineer of construction, becomes engineer of design, a move which will give the design department the practical experience of a veteran construction man.

W. K. Dinklage recently assistant to Reed, has been made construction engineer. W. E. Allison, engineer of right-of-way, becomes engineer of secondary roads. R. R. Ireland, on special assignments of late, replaces Allison as right-of-way-engineer.

Griffith to direct new bituminous concrete association

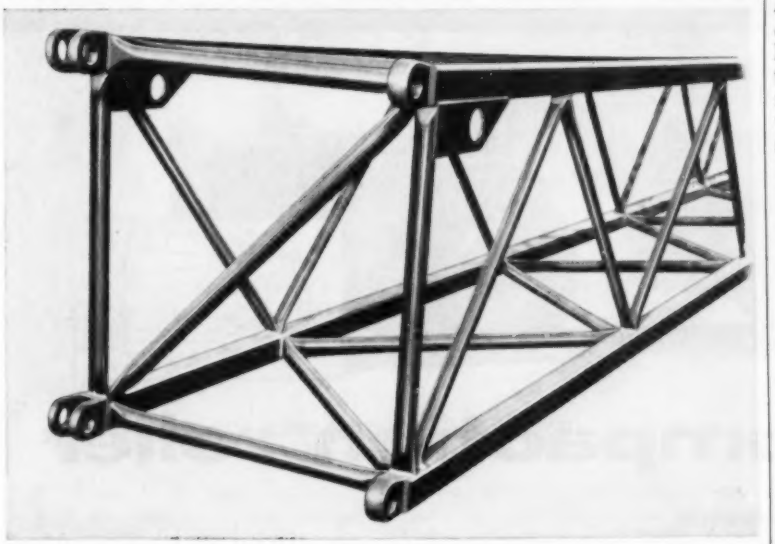
H. Keith Griffith, formerly Commissioner of Highways, state of West Virginia, has been appointed Executive Director of the National Bituminous Concrete Association. A national office is being opened at 1145 19th Street, N.W., Washington, D.C., according to S. G. Hayes, asso. pres.

Mr. Griffith is a past vice-president of the Southeastern Association of State Highway Officials, and formerly was a member of the West Virginia Turnpike Commission.

NEW LORAIN CRANE BOOM

Square Tubular Chords . . . Tubular Lacing . . . Increased Capacities with Less Weight, More Strength

Thew-Lorain Crane Boom Design Increases Lifting Capacities . . . Permits Handling and Traveling with Longer Booms . . . Other New Crane Boom Features Provide Ease of Assembly Plus Total Lengths to 150 Feet*



Here's a brand new Crane Boom design that reduces boom weight 20 to 30%. Lighter, yet stronger, you can now put this weight saving to work for you in increased lifting capacities. The new Lorain "Square Tubular" Crane Boom is based on a new material and design idea. Departing from the conventional angle or tube construction, Thew-Lorain has selected square tubular members for the main chords of the boom. These are laced together with continuous lengths of round tubular lacing, preformed and welded to the square chords. The method of fabricating the lacing to the chords requires less lacing, saving weight, yet gives the same high torsional resistance and columnar strength as obtained by "banding" the boom. This revolutionary, new crane boom design is available as standard equipment on Lorain 8, 10 and 25-ton crawler cranes and 10, 22½, 25 and 30-ton rubber-tire cranes.

*2-PIECE TIP EXTENSION

The same principle of square tubular main chords, as used in the main boom, has been applied to the Tip Extension to give maximum lifting capacities at minimum weight. Tip extensions are made in 2 pieces, with suitable center sections, to permit varying overall length to meet job needs. For instance, on Lorain's 30-ton Moto-Crane, 150 ft. of boom including tip extension may be used. Tip extension may be used as straight or gooseneck extension.

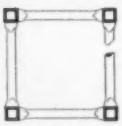
TILTING MAST-TYPE GANTRY

Recommended for use with all long booms . . . (1) for easier raising of booms from flat positions, and (2) to reduce stresses in long booms, pendants and cables while operating. Fabricated of square tubes, Gantry is hinge-pin connected to the Boom base and may be lowered for travel, or easily removed.

HANDLE LONGER BOOMS

The new, "Square Tubular" Crane Boom design, with greater strength at reduced weight, permits (1) increased lifting capacities, (2) raising longer booms from flat position, (3) traveling with longer booms over the rear. Crane sections are equipped with "erecting lugs" for ease in assembling long booms.

This shows a cross-section of the new "Square Tubular" Crane Boom design on which Thew has applied for a patent on the construction of this equipment and the method of fabricating it.



3-SHEAVE BOOM HEAD

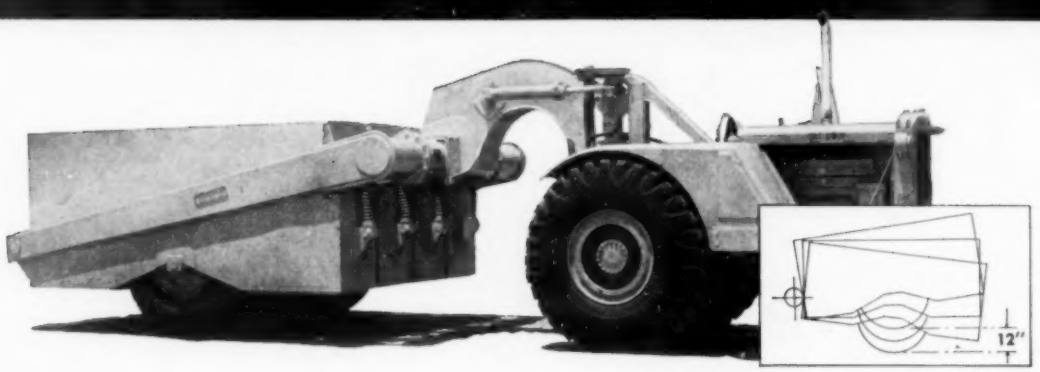
This 3-sheave Boom Head permits reeving 6 parts of hoist line without the use of a top block and the resulting loss of vertical working range. Boom Heads are designed for ready installation of tip extensions or pile driver leads.

THE THEW SHOVEL CO.
Lorain, Ohio

. . . for more details circle 266, page 16

for compacting earthfills

SELECT SOUTHWEST



Southwest compaction roller

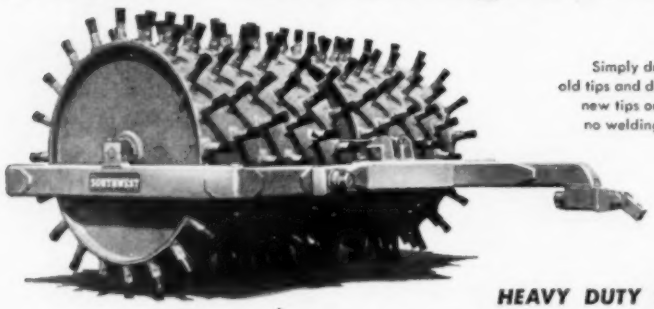
5 SIZES WITH WEIGHT CAPACITY FROM 10 TO 100 TONS

ADAPTER FLANGE permits change of draft beam to suit any tractor.

FEATURING:

1. Greater wheel oscillating freedom with each wheel mounted in an independent weight box unit.
2. Heavy duty, reinforced gooseneck and sectionalized hauling yoke.
3. Swivel hitch with Timken roller thrust bearing.
4. Each wheel equipped with two large Timken bearings.
5. Sectionalized hauling yoke permits use of 2 to 6 wheel units.

Southwest sheepsfoot roller



Simply drive off the old tips and drive on the new tips on the job — no welding required.

HEAVY DUTY MODELS FEATURING:

1. Full oscillating double drums.
2. Timken roller thrust bearing at oscillating pins.
3. Two-piece foot with replaceable tips — permits changing size or replacing tip in the field without welding.
4. One-inch steel drum shell.
5. Heavy duty, reinforced box steel frame.
6. Large swivel hitch with Timken roller thrust bearing.

11 SIZES WITH WEIGHT CAPACITIES FROM 5 TO 20 TONS

WRITE TODAY for illustrated folders giving complete data and specifications.

Southwest Welding & MANUFACTURING CO.
CONSTRUCTION MACHINERY DIVISION
ALHAMBRA, CALIFORNIA

. . . for more details circle 257, page 16

At Highway Research Board Session

Ideas Fly Thick and Fast on Equipment Utilization

Contractors, engineers and manufacturer representatives brought together in lively review of job problems, under auspices of re-activated research committee on highway equipment.

ROADS AND STREETS STAFF REPORT

HOW best to get the most out of all the wonderful new equipment available for roadbuilding, was the subject of a rather unusual panel session at the recent Highway Research Board annual meeting held January 17-20, in Washington, D.C., staged under the auspices of a rejuvenated committee on highway equipment, the session brought together men representing all points of view. Interest centered in compaction and utilization of earthmoving roadbuilding equipment.

The revived committee, re-activated under the stimulus of the enlarged highway program which looms, draws its membership from the highway departments, Bureau of Public Roads, contracting organizations and equipment manufacturers. Its work will be watched with keen interest since it represents perhaps the most direct tie yet attempted between the planner, engineer, and technician, and the contractor who must use available equipment to accomplish a given result with speed and economy.

The panel was moderated by Harold F. Hess, executive vice-president, Construction Industry Manufacturers Association. Panel speakers were: Walter Van Buck, division engineer, Bureau of Public Roads; John P. Moss, Moss-Thornton Company, Leeds, Alabama (newly elected president of the Contractors Division, ARBA); R. P. Jones, sales division, Harnischfeger Corporation; Howard R. Craig, chief, Bureau of Construction, Ohio department of highways; John P. McGinnis, of C. J. Langenfelder and Son, Inc., contractors, Baltimore; E. E. Howard, consultant on contractor problems, Caterpillar Tractor Co.

● *Van Buck, of the Bureau,* discussing the efficient use of equipment on highway construction, pointed out that the 10-year national highway

● Better utilization of today's and tomorrow's new earthmoving equipment will be a multi-billion-dollar problem in the enlarged highway program which looms. Basic research to find better (and faster) tests for embankment quality control, and new studies in equipment utilization are seen to be needed. (Photo by Roads and Streets staff, showing fleet of B. Perini & Sons, Inc., on Massachusetts turnpike, 1955; 2,000 cu. yd. per hour being moved despite soft sand and long haul).

Some Pros and Cons on Compaction and Equipment Utilization

● *John P. McGinnis*, of C. J. Langenfelder & Son, Inc.: "We built good highways in the days before the present rigid density requirements were in force. For example, the Original Pennsylvania Turnpike."

This panelman in discussion noted that on one job, in gravelly material, fills could have been condensed satisfactorily in 18-in. layers, whereas 8-in. layers were required — example of waste of compaction effort.

McGinnis put in a good word for the Buffalo-Springfield K45 Kompactor, "one of the most efficient machines we have, which combines the effort of a sheepsfoot with that of the flat steel roller while moving at 4 to 5 mph or faster. We compacted up to 5,000 cu. yd. per 8-hour day at 97% of standard density with this unit on one job."

● *E. E. Howard, Caterpillar Tractor Co.*: Sometimes a detail like the location of the maintenance shop will contribute to poor maintenance of equipment and down time.

Close attention to job details by the owner, if a small contracting company, or by a top administrative man if a large firm is necessary to insure best job management and equipment care. It keeps the men on their toes.

Howard cited a survey of contractors showed that only 2 of 115 replying kept cost data that would enable them to know when to use a heavy rubber-tired compactor, compared with other type.

program of $100 billion would require $30 billion worth of equipment for earthmoving. He also pointed out that construction specifications and design must keep pace with new equipment, with heavier equipment available, for example, thicker lifts should be used on embankments. Van Buck also points out the need for uniformity of state specification, highway desirable, to permit use of larger equipment now available and being developed and to permit ready understanding of specifications on the national highway program. He also advised that contractors lost considerable time on the job due to poor balance of equipment. Emphasis was also given to the fact that minor delays on a job, while insignificant in themselves, add up to a high total of lost time. Van Buck stated that personnel will waste approximately 3½% of their time while on a job, equipment operators 2%, and approximately 3% is lost by late starting and early quitting. He stated that contractors lose from 8% to 38% of available time on the job, which is costly to them and also results in higher bids.

● *Contractor Moss*, speaking "off-the-cuff" on "Contractors Look at Earthmoving," and "Contractors' Equipment," expressed concern over the fact that contractors are facing an unstable equipment condition even now. In the past, contractors throughout the country had a bank of equipment in their yards, placed there by the equipment manufacturers, which gave them an opportunity to bid on many types of jobs, utilizing the best equipment.

This contractor is also concerned with financing the purchase of new equipment by contractors, in the event the national highway program is approved. He expressed considerable concern over the unknown job productiveness and performability of equipment being rushed into factory production without being thoroughly tested. Further concern was expressed over the fast-changing design of equipment which is being hastened by competition between the old long-time equipment manufacturers and the many new manufacturers who have entered the field. Moss feels that there is too much specialization of equipment for a contractor to gamble on establishing a pool of equipment. He stated, however, that the contractor must keep pace or he will be outbid, outside, and finally "out."

● *Panelman R. P. Jones* of Harnischfeger, speaking on shovels in highway excavation, pointed out that excavation prices today are about the same as in 1923, in spite of the many rising costs in the construction industry throughout the country in general; improvements made in shovels by the manufacturers have enabled the contractor to maintain the same approximate level as 30 years ago. Most of these improvements have been accompanied by reduction in weight of equipment, thus increasing the power-to-weight ratio; a reduction of 20% to 30% in weight has been made in shovels, while the same capacity has been maintained. He estimates this as about the maximum reduction possible in the weight factor.

Jones pointed out that although most highway construction projects are adapted to the use of large earthmoving scrapers and wagons, it is a rare occasion when some shovels are not required on such projects for specialized work, or for work in areas where space was limited.

The Harnischfeger official noted, too, that contractors' bids on highway work are dependent upon the construction, equipment capacity, size of the project and length of time permitted to complete the work. The latter item is affected by the cost of mobilization and demobilization of equipment.

Further discussing the problem of movability from one location to another, Jones stated that a ¾-yd. shovel or dragline was the maximum size that can be moved without dismantling. Above this size, the amount of dismantling increases, with a resulting increase in cost. This cost is not in direct proportion to the increased capacity of the shovel and is varied by size and load limitations on the highways imposed by various states. Legal limitations dictate a greater or lesser dismantling of equipment and mounting on separate trailers. Size limitation in most states govern movement of vehicles over highways. He stated that the difference in cost between dismantling and moving a ¾-yd. shovel and a 1½-yd. shovel is about 30%.

Such problems as these have caused the manufacturers and design engineers to concentrate on ease of assembly and disassembly of moving equipment, in order to lessen time consumed in these operations.

Jones, too, emphasized the need of a universal load limit in the 48 states, in order that the design engineers will not be faced with "state line" problems of cutting down on truck or trailer loads. He emphasized that equipment manufacturers do not recommend unlimited load capacities or capacities which would be detrimental to the highways. Reasonable and universal limits would simplify the contractor's problem and probably re-

(Continued on page 82)

S & M Construction Company, Providence, R. I., uses 12 of these Mack LJSWX diesel dumpers under 2-yard Lorain shovel in excavating peat bog near Atholl, Mass., on a by-pass for U. S. Route 20.

ONLY A SPECIALIST NEED APPLY...

. . . For only Macks can get in and out of mud like this under their own power!

Axle deep in soft, soupy mire and hauling a full load of heavy peat bog, 80% water, this Mack dumper will pull out of the muck and be on its way . . . and back again on schedule.

It's Mack's famous Balanced Bogie, along with Mack's exclusive Power Divider, that makes seemingly impossible tasks like this everyday assignments for Macks. This wonder-working team delivers torque to each wheel in proportion to its traction. In addition, it assures uniform tire loading and braking on all four rear wheels, and maximum stability under any terrain or road conditions.

When you add the Balanced Bogie and Power Divider to Mack's rugged construction, ease of maintenance, and economy of operation, you'll see why Macks are the most versatile trucks, the biggest money makers in the construction industries today. See your Mack Branch or Distributor for complete details. Mack Trucks, Empire State Building, New York 1, N. Y.

MACK . . . *first name for trucks*

3569

. . . for more details circle 238, page 16

Equipment Utilization

(Continued from page 80)

sult in lower bids by contractors operating over a wide area.

Concerning the problem of the contractors submitting bids, Jones strongly urged that contractors make a more thorough investigation of projects before bidding and not take the plans and specifications for granted. Coupled with this, he recommended that any interested contractor make a careful analysis of equipment requirements for each job on which he was bidding.

● *Howard R. Craig*, of Ohio, speaking on earth work compaction specifications, described the methods now being employed by his highway department to simplify the specifications on compaction. These methods are expected to lower contractors' prices on jobs involving compacted fills and other earth work. Craig pointed out that many state specifications today are based strictly on moisture and density control, a method devised 20 years ago.

Craig noted that despite recent improvements in practices and the advent of larger, heavier, and more efficient equipment, unit costs have not materially decreased. This condition he feels can be attributed to outmoded specifications. Within relatively broad limitations, Ohio specifications grant the contractor considerable leeway on compaction jobs. Many state specifications make no requirements in regard to the type of equipment or rollers, or the number of roller-hours required on earth fills, but simply provide that the end results with water should comply with AASHO specifications 93-102, T-99; no minimum moisture control is required; the maximum final moisture content is 2%. To eliminate further uncertainties, Ohio bids require that excavation prices be a separate unit item and that water required for necessary compaction shall be paid for on a bid basis of 1,000 gal. used as may be necessary or directed by the engineer.

Final testing is accomplished by operating a rubber-tired roller with a 25,000 lb. wheel load over the compacted area, making four passes with two complete coverages.

In his concluding statements, Craig suggested that in the future, new specifications may be desirable, based on the use of nuclear radiation materials for determining moisture and density.

● *Panel member John P. McGinnis*, of C. J. Langenfelder and Son, Inc., taking his turn on the contractor's viewpoint on the use of compaction and earthmoving equipment, stated that experience of his company indicated compaction on highway jobs had become a major part of the contractor's expense. To offset this circumstance, he recommended that compaction equipment must be improved and greater operating speeds provided.

In McGinnis' opinion costs were considerably higher due to unreasonable requirements specified by the engineers. He cited as one of many problems stemming from this source, the one having at the end of the working day produced satisfactory compaction on a fill, meeting all requirements, only to find next morning that the contractor is prohibited from working on the next section because of an inch or two of overnight frost. This condition made the inspector or resident engineer reluctant to permit heavy equipment to pass over the preceding day's work.

● *E. E. Howard of Caterpillar*, speaking on construction techniques, advised that with the trend towards shorter job periods and with tighter compaction requirements, greater

hauling distances, as well as the desire of contractors to cover large areas — equipment previously considered adequate could not be used to economic advantage. He cited the example of not too many years ago when an 8 cu. yd. struck capacity scraper was considered adequate for most any heavy earthmoving job; whereas today, a contractor hesitates to bid on a large earthmoving job without at least 18 cu. yd. struck capacity scrapers, if he wants to be in the bidding and able to make a reasonable profit.

Howard also pointed out that the selection of equipment by contractors was becoming more complex each year; not only are the long-time manufacturers making new equipment but many new companies are rapidly coming into this field. He also covered the controversial question of whether torque converter or standard drive equipment should be purchased. His advice on this point was that equipment such as scrapers, bulldozers and equipment which are subject to intermittent use would be more economical if equipped with a standard drive. Equipment with torque converters he said is recommended for operations which are continual, such as cradling of pipe, backfilling, and pushing.*

On the question of two-wheel, pneumatic-tired tractors versus four-wheel, Howard cited the advantages of the two-wheel rubber-tired tractor as being easy to steer, having extreme maneuverability but with a limit of approximately 20 miles per hour. The four-wheel rubber-tired tractor, as seen by this manufacturer's representative, is better adapted to hauling over rough spots at high speeds and has over-the-road speeds of 35 to 45 miles per hour. Harris reiterated some of the remarks of the previous speakers, stressing that one of the big problems of contractors today was the cost of mobilization and demobilization of equipment from job to job. He, too, feels there is a necessity for a reasonable standardization of load limits between the various states.

Another problem which he considers of primary importance to contractors is the availability and the lack of selection of operating personnel. Howard pointed out that for a great

(Continued on page 129)

**See article, "Torque Converter vs. Direct Drive," by Kenneth F. Park; Roads and Streets, September, 1955, for detailed recommendations covering various tractor applications and job conditions. Editors.*

How We Use Contractors and Their Equipment in Highway Maintenance

By G. A. Meskal

Maintenance Engineer, Minnesota Department of Highways, St. Paul

During 1955, the Minnesota department awarded 41 maintenance-type state highway jobs, totaling $1,700,000. A still larger sum was spent for hiring of privately owned equipment, most of it contractor owned.

THE MINNESOTA department of highways is responsible for maintaining 11,800 miles of state trunk highways at an annual expenditure of about 15 million dollars. Outside of work performed by contract, major expenditures consist of: about 38% for labor, 20% for material, 32% for equipment, and 10% for overhead. Contract work amounts to about 27% of the total maintenance expenditure. In contrast with construction work, which covers a small percentage of the total mileage at any one time, maintenance work generally covers the entire mileage with one or more phases of operation at some time during the year.

There is a gross misconception by the public that after a highway is improved, maintenance is negligible. This is not the case, inasmuch as our experience has been that maintenance costs have increased on high-type roads due to increased traffic and public demands for other refinements in maintenance. It is our hope that a newly reconstructed highway will require less surface maintenance than an old one, but it is up to us to see that the same safe, smooth condition as was originally constructed is kept up, and we are confronted with a continual battle against the elements and traffic wear.

As told at the annual meeting of the Associated General Contractors of Minnesota, St. Paul, January 13, 1956.

Highway maintenance includes a variety of activities and operations necessary to preserve the roadway surface, structures and roadsides, including those incidental traffic services and various so-called housekeeping duties that help make the highways safer and more attractive. Maintenance work is usually identified by four classes of work: routine, special, extraordinary and betterments. These are further subdivided into about nine items of work; and under these nine items there are about 35 different operations.

● *Basic Maintenance.* In highway maintenance, it is necessary to have a basic organization with necessary equipment and materials to perform the routine work such as surface patching, spring repair, drainage work, weed cutting, signing, rubbish pickup and other miscellaneous operations. This is also true of snow removal, ice control, flood and storm damage, road and bridge failure, emergency repairs, etc., as the crews must be available at any time of day or night, as well as Sundays and holidays, to do the necessary work of repairing or reopening the road as quickly as possible and maintaining a safe travelable surface at all times.

It would be very difficult and practically impossible, to let to contract many of the items because of the large number of variables, and because it is practically impossible to define the work so that it could be let by contract.

However, cost of special equipment and lack of specialized or trained personnel does not lend itself to have us perform all of the work by our own forces and, consequently, it is necessary that we call on the contractors and their organizations who have this equipment and trained personnel. Our organization should be such as to take care of routine work and immediate emergency repair work. Other specialty jobs can be performed more efficiently and economically by contract. There are seasons of the year when there are peak loads of work, when it would be impractical for us to build up our

Highway Maintenance Work Can Be Made Attractive to Contractors

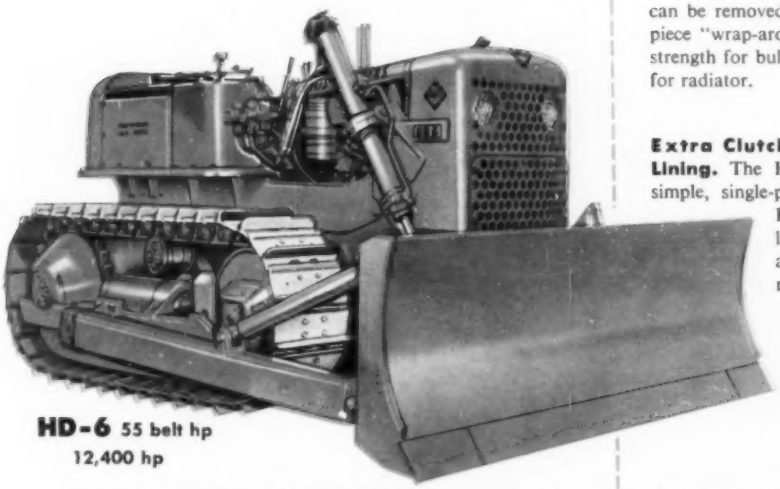
In order that maintenance by contract be successful, we must maintain the contractors' interest in the projects which are proposed to be let. In other words, the projects must be attractive so that there is an incentive to bid.

With this in mind, we have attempted to group our jobs to include the work in several districts. There must be competitive bidding so that the work can be accomplished economically and in competition with day labor methods.

And, perhaps most important of all, promptness is sought of execution of the project. Maintenance differs from construction in that work scheduled to be done is usually critical in nature, and rapid performance and early completion of the work are usually required.

One of the most frequent reasons why district maintenance organizations prefer doing the work by day labor is because they claim they cannot get the work done when it should be done. Therefore, it should be emphasized that if contract maintenance is to be continued or expanded, it will be necessary that the contractors give this matter their careful consideration. — *G. A. Meskal.*

This kind of Crawler Tractor Design gives you extra output



HD-6 55 belt hp
12,400 hp

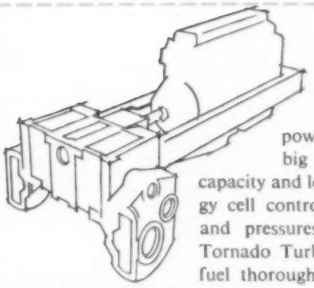
. . . and only Allis-Chalmers HD-6 has it—

advanced design features that combine big performance, versatility, dependability and simplified servicing!

Look at the Allis-Chalmers HD-6—you can see its functional design . . . how it's built to give sure-footed traction, better working balance. But there's more to this crawler tractor than meets the eye—the performance advantages of Allis-Chalmers advanced basic design. It provides more working power, more strength in all components, more working weight where it's needed . . . makes the HD-6 an outstanding performer with drawn or mounted equipment . . . easier to operate and maintain.

Let your Allis-Chalmers dealer show you how the HD-6 can give you that *extra* output on your jobs.

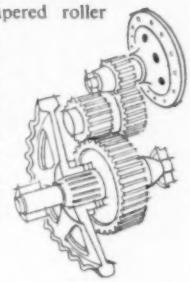
ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN



Allis-Chalmers Heavy-Duty Diesel Engine. The HD-6 power plant is designed for big output, ample reserve capacity and low maintenance. Energy cell controls combustion timing and pressures for high efficiency. Tornado Turbulence mixes air and fuel thoroughly for more complete burning. Follow-Through combustion sustains effective working pressures to take advantage of better crankshaft leverage.

Special Strength and Protection. Exclusive all-steel box-A main frame makes possible superior over-all balance, better equipment mounting . . . plus service simplicity of unit construction. Major assemblies like engine and clutch can be removed without disturbing adjacent parts. One-piece "wrap-around" radiator guard provides maximum strength for bulldozer mounting . . . complete protection for radiator.

Extra Clutch Life—with Ceramic Lining. The HD-6 master clutch offers simple, single-plate, over-center design. Revolutionary new ceramic button clutch lining keeps clutch operating longer between adjustments . . . lengthens clutch life . . . reduces lever pull for easier operation.



Straddle-Mounted Final Drive Gears. Tapered roller bearings support both ends of the final drive gear shafts. Smaller gears and shorter shafts (plus line-bored, one-piece case), provide better bearing and gear alignment, more strength, longer life. Double-reduction final drives provide greater ground clearance.

New-Design, Heavy-Duty Track. HD-6 track provides long life under the toughest conditions. HD-6 sidebars have more steel where it's needed . . . benefit from new heat-treating methods which make possible new standards of strength and hardness throughout for extra wearability.

Other Outstanding HD-6 Features

. . . no other tractor in this size class has them—at no extra cost you get roller bearing truck wheels, idlers and support rollers; 1,000-hour lubrication intervals for truck wheels, idlers and support rollers; 24-volt direct electric starting; crankcase guard; bumper; and lights.

ALLIS-CHALMERS

. . . for more details circle 181, page 16

Types of Maintenance Contracts Awarded in 1955

Type of Work	No. of Contracts	Amount	No. Bids Received
Clean and seal joints in conc. pavement	2	$576,785.00	6
Road mix	3	100,012.32	20
Stabilized gravel shoulders	2	78,102.90	11
Grading, gravel base and bitum. surface	1	64,317.30	3
Gravel base and plant-mixed bit. surface	1	122,999.08	2
Metal crib wall	1	10,644.16	3
Bituminous seal coat	7	355,427.52	27
Weed spraying	1	9,780.00	3
Application of calcium chloride	3	44,580.00	8
Aggregate production	19	357,864.03	96
Pipe culverts	1	6,588.00	4
	41	$1,727,100.31	183

own organization sufficiently to handle the work load, and we would be faced with the problem of what to do with the men and equipment during slack periods.

● *Contractable Items.* There are some operations which we find are adaptable to the contract method, on which proposals can be prepared with definite pay items. It has been our policy to let this work and, in general, standard specifications are used in maintenance contracts, modified by special provisions when necessary. Types we feel are adapted to contract performance are as follows:

Bituminous surface retreatments, repairs
Bituminous seal coats
Production of mineral aggregates
Regraveling
Stabilized gravel shoulders
Culvert installations
Sodding
Liquid appl. of calcium chloride
Weed spraying
Cleaning and sealing joints (concrete)
Guard rail installation
Stockpiling

There may be other types of work which could also be included in this list which would relieve our own maintenance forces of part of the maintenance burden, and thereby make them available for other routine work, which at times is necessarily neglected because of special jobs.

In 1955, the maintenance department awarded 41 contracts for various projects throughout the state as tabulated.

These contracts were awarded to 28 different contractors. A total of 183 bids were received, which indicates that there was intensive competition for the work. In addition, there were three 1954 contracts which were carried over for completion in 1955. Of these 44 contracts, 39 were completed and 5 were carried over for completion in 1956 — three of which were aggregate production contracts suspended because of severe weather conditions, and the other two had 1956 completion dates. Of these 44 contracts, only five were in overtime status, and on three penalties were assessed; two are being reviewed. This indicates that we are getting splendid cooperation from the contractors on our maintenance contracts.

In addition, extraordinary maintenance agreements were entered into with cities of Duluth, St. Paul and Minneapolis and contracts for this work were let by the cities in the amount of $399,150.43.

● *Rented Equipment.* In 1955, about $1,725,000 was spent for hired equipment, which we consider advantageous over trying to own and operate the equipment ourselves. It has been our policy to rent equipment so as not to build up inventories of heavy special equipment, usually expensive to operate and not needed for our usual maintenance operations. Many types of equipment, usually fully operated, were hired on an hourly basis, determined by lowest bid received.

During 1955, more than 2,000 sealed proposals were received in response to the state's advertisement for bids for rental of equipment.

Hired motor graders are used largely for removing compacted snow and ice from roadway surfaces during the winter, which we have found to be the most practical way of getting rid of the slippery surfaces. Bids on more than 300 contractors' motor graders were received in November, 1955. In 1954, we spent $150,000 for motor grader rental, and in 1955, over $344,000.

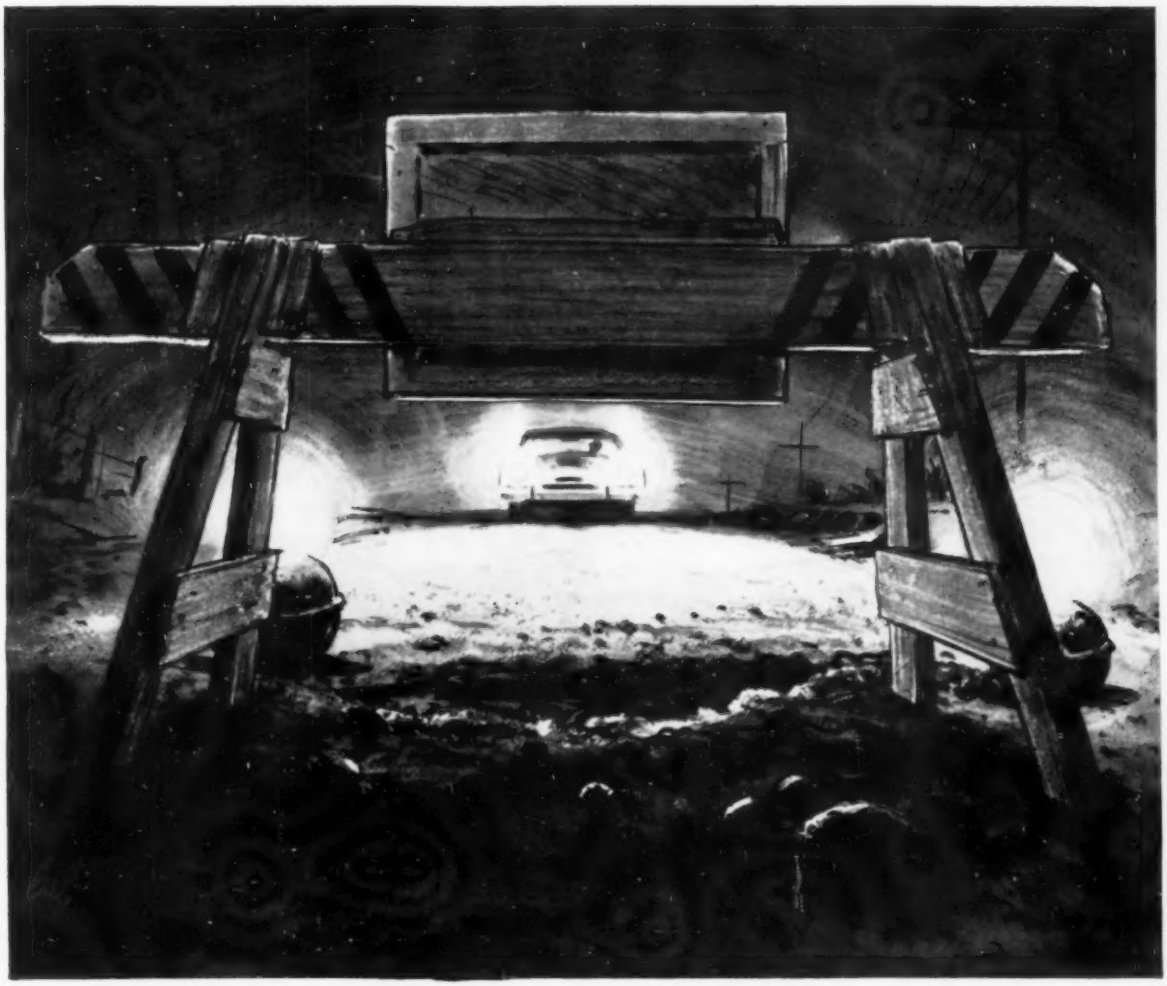
In addition, under Minnesota law, the state highway commissioner is authorized to establish rates of hire for owner-operated equipment, under which such equipment can be utilized on a temporary basis during any 30-day period. The owner's earnings are limited to $400 during any one employment period. In 1955, about $210,000 was spent for this type of equipment, and about 750 individual owners were employed. Included in this group are man and truck, and man and tractor.

The total value of contract work and contract equipment rental contracts in 1955, thus totaled about $4,000,000, which is about 27% of the total maintenance expenditures. It is anticipated that the work which we proposed to contract in 1956, will be comparable in volume.

● NEW WORTHINGTON VICE PRESIDENTS. Worthington Corporation has announced the election of Elston J. Tribble and Aloysius M. Tullo as vice presidents. Mr. Tribble, former assistant vice president — manufacturing, will have general supervision of a group of Worthington operating divisions which were recently organized under the corporation's decentralization program. Mr. Tullo will continue as general manager of Worthington's largest division, at Harrison, N. J.

Types of Equipment Rented from Contractors

Air compressors
Bituminous distributors
Bit. pavers or travel plants
Bit. power brooms
Bit. tank transport truck
Bit. tank car heater
Chain saws or power saws
Cranes — mobile
Draglines
Farm tractors
Man and team — mowers
Motor graders
Power mowers
Rollers — pneumatic — tamping
Rollers — steel
Self-powered sand spreader
Shovels and backhoes
Rotary plows
Steam boilers
Tractor and dozers
Tractor and front-end loader
Tractor and scraper
Truck — Hitch and elect. brakes
Trucks — plow and wing
Trucks — dump
Trucks — trailers
Trucks — flat bed and service
Weed sprayers — self-powered



End excessive road repairs

Stabilize your roads with Morton Salt

● Cut aggregate loss ● Save man-hours and maintenance money ● Reduce accidents caused by loose gravel

Send for this free book on how Morton Salt helps you build better roads at far less cost! Mail this coupon today!

Gravel roads stabilized with Morton Salt give more service per dollar than roads built by any other method. (Savings in aggregate alone more than pay for the salt.) You get smooth, durable, water-repellent surfaces that require minimum maintenance.

Stabilizing the base course of primary roads with Morton Salt helps prevent the 9 out of 10 road failures which result from faulty foundations.

. . . for more details circle 241, page 16

Please send me your free booklet on salt stabilized roads.

Name_____
PLEASE PRINT

Title_____

Address_____

City_____ County_____ State_____

MORTON SALT COMPANY
INDUSTRIAL DIVISION
Dept. RS-3, 120 So. La Salle Street, Chicago 3, Illinois

NOW *bid beating... dirt heaping...* 1956

10% bigger payloads!

Model "75" ... boosted to 20 yds heaped (without sideboards) ... 262 hp.

Model "55" ... boosted to 14 yds heaped (without sideboards) ... 172 hp.

Wide-base tubeless tires and windshield, shown, available as optional equipment.

1 **Wider "Target" Push-Block** makes it easier to make and maintain contact. Helps to cut loading and cycle time.

2 **Straight-Line Ejector Reeving** requires minimum power; leaves more power on Payscraper wheels for faster dumping and spreading. Also speeds re-threading time.

3 **Sturdy Cover Plates** protect new, stronger cylindrical ram and air tanks.

4 **New, Straight-Back Bowl** lets you heap and haul more dirt every trip. Struck capacity, *with sideboards*. 18 cubic yds on "75"—12 cubic yds on "55".

5 **Higher Apron Lift,** bigger apron opening, provides cleaner, more rapid dumping, especially of "sticky" materials.

6 **Fast-Acting Apron,** arms mounted outside bowl, assure quick, positive closing of apron. Payscraper holds the load from cut to fill.

7 **Lowered Draft Frame** provides operator with "control tower" visibility of bowl and push-tractor ... also helps direct push and pull power more efficiently to cutting edge for faster loading.

8 **Larger, Wider Fenders** give greater safety for operator, greater protection for machine.

International Payscrapers®

Maximum 52° Oscillation
from right to left takes the stress and strain out of hauls over furrows, rough ground.

Adjustable 3-Piece Cutting Edge
for clean, fast cutting and loading under all soil conditions.

New, Long-Lasting Clutch
of ceramic material and powdered metals, successfully resists heat and wear over longer periods. Available on Model 75 only.

Put the 1956 International Payscraper to work on your job, and watch dirt boil up into its new, straight-back bowl. You've never seen any big scraper load as easily or as fast. In seconds, you've packed in up to 23 heaped yards. Its offset 3-section blade breaks the ground like a sharp-pointed spade. Dirt boils from the smooth-slicing cutting edge and fills the corners to build a full heaped load. Close the apron instantly, positively, on this huge, well-compacted load and you carry all the dirt you've heaped in.

Now, drive easily, effortlessly with safe hydraulic power steering at a fast clip to the fill. Note how the 1956 Payscraper's extremely high ratio of horsepower to capacity and its rapid acceleration to 24 mph top speed add up to more trips per hour than any other self-powered scraper you've ever used. Yes sir, it's a real profitable dirtmover, this 1956 Payscraper! Try one yourself on your job! See your International Industrial Power Distributor for a demonstration.

INTERNATIONAL HARVESTER

International Industrial Power

INTERNATIONAL HARVESTER COMPANY, 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Tractor and Rubber-Tired Loaders . . . Diesel and Carbureted Engines . . . Farm Machinery . . . Motor Trucks.

. . . for more details circle 227, page 16

Tractor-Shovels in Construction and

● One of the toughest tractor-shovel jobs is the handling of broken-up pavement material. This Caterpillar No. 6 Traxcavator, owned by J. C. O'Connor Construction Co., is slamming through such an assignment on a reconstruction project, U. S. 54, Illinois. (ROADS AND STREETS staff photo.)

Why tractor-shovels have gained so rapidly as a roadbuilding and construction tool is reviewed by the author, who makes challenging statements on this equipment's competitive advantages.

By Fred L. Baumann

Shovel Specialist, Caterpillar Tractor Company

THE idea of combining the abilities to dig, transport, lift and bulldoze material with the mobility, durability and low first cost of crawler and wheel-type tractors had its inception about 30 years ago. The growth of tractor-shovel sales, particularly since the end of World War II, bears out the fact that the early developers of tractor-shovels were striving for a needed tool. (See attached Chart I).

These figures do not include the integrally built wheel-type front-end loaders such as those manufactured by Frank G. Hough, Clark Equipment Co., Pettibone-Mulliken, and others. These latter machines, as well as more recent track-type tractor-shovel offerings, reflect the growing trend toward specialized design. The importance of this type of machine to construction men and those in allied industries demands that this trend continue to grow. There is only one valid reason for this sales volume growth: These machines perform more jobs more economically than any other method available.

In sales, tractor-shovels compete with everything from hand-shovel workers to power shovels with 2½-yd. dippers. The work applications of these versatile machines covers a range as wide as that of the methods and machines with which they compete.

● *Many Attachments.* The general description of these machines indicates that hydraulic tractor-shovels incorporate to some degree, the performance characteristics of such special tools as power shovels, cranes, bulldozers, and to some extent, scrapers and motor graders. Obviously,

many attachments other than buckets must be available to realize the maximum versatility of these machines.

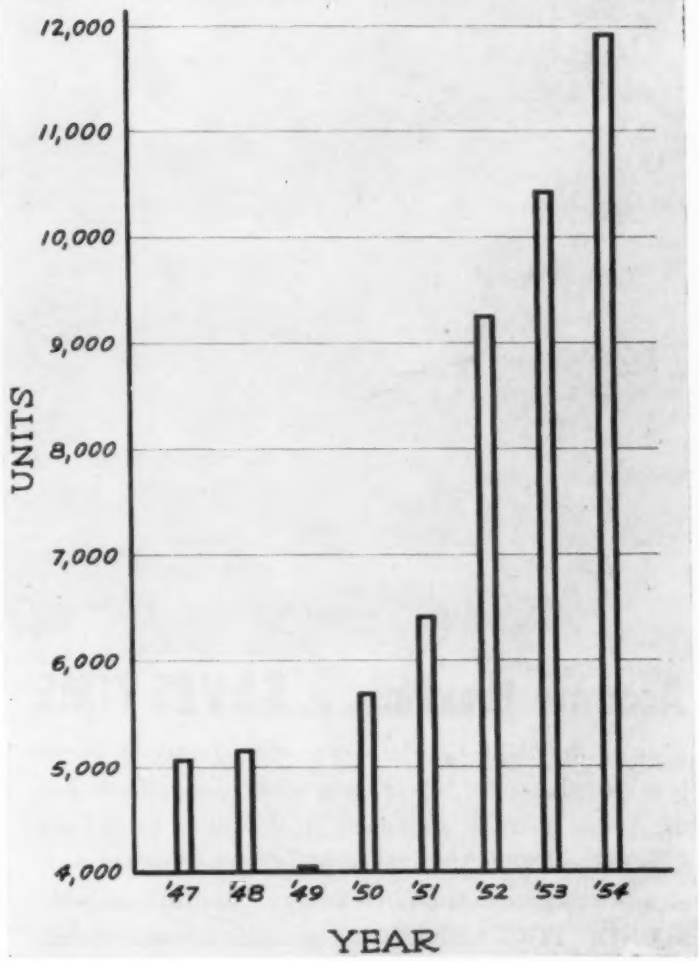
Some of these are: 1. Skelton rock buckets, 2. Light material buckets, 3. Lift fork with or without hydraulic top clamp, 4. Rear mounted hydraulic ripper, 5. Angling bulldozer, 6. Land clearing rakes, 7. Rear mounted towing winches, 8. Scraper control equipment — hydraulic or cable, 9. Side dumping buckets.

● *Loading.* In general there are four classifications of work done by tractor-shovels. The first function is represented by such activities as *loading* sand and gravel, earth, blasted or crushed rock, cinders, slag and other materials into a hauling unit or hopper with a bucket equipped machine. With a log and lumber fork, very efficient loading performance is obtained with saw logs, pulpwood, ties, poles and stacked lumber. Palletized loads such as truck or airplane cargo can also be handled with these forks.

● *Lifting and Hauling.* A second function of fork or bucket equipped machines is *lifting and hauling.* They find use on structural projects carrying and placing bricks, wet concrete, concrete blocks, lumber and other materials from depots to their points of use. Sanitary landfill operators utilize their ability to lift and carry in obtaining and spreading cover material. Steel mills are turning more and more to tractor-shovels to solve their

CHART I

POSTWAR SALES of TRACTOR SHOVELS



● Graph shows rapid increases in sales of tractor-shovels since 1947. These figures include all industrial shovel-type loader attachments. Statistics are taken from Census "Facts for Industry" for all sizes and types of tractors.

CHART II

ELEMENTS IN SELECTING TRACTOR SHOVELS

SIZE	WEIGHT - LBS.		POWER - H.P.		CARRYING CAPACITY-LBS		APPROX. PRICES		APPROX.*
	WHEEL	TRACK	WHEEL	TRACK	WHEEL	TRACK	WHEEL	TRACK	COST/HR.
1 C.Y.	12,750	15,000	80	50	4,000	5,000	$10,000	$9,500	$2.60
1½ C.Y.	18,500	21,000	95	70	5,500	7,000	$13,000	$13,000	$3.30
2¼ C.Y.	24,000	30,000	130	100	7,500	10,000	$16,500	$18,000	$4.50

* OWNERSHIP & OPERATION W/O OPERATOR

● Comparison of track-type and wheel-type tractor-shovels as to weight, power carrying capacity and approximate prices as well as the approximate cost per hour of these machines, under comparable conditions.

slag disposal problem around open hearth furnaces.

● *Excavation.* A third function is *excavation.* Excavating contractors, particularly those who specialize in basement digging to support the current housing boom, find the tractor-shovel an excellent tool. The ability of the bucket to handle more material per pass than a comparable dozer, plus its ability to lift and dump over stockpile crowns, contribute to more economical operation. Excess material can also be loaded into trucks by the same machine. If ground conditions are adverse, the same machine can be used to deliver building materials until it is needed for backfilling.

● *Land Clearing.* The fourth function is *land clearing.* Either bucket or rake equipped machines make excellent land clearing and pioneering tools. Trees and stumps fall easy victims to its high lift and tip-back bucket action. Experience with tractor-shovels and comparably sized bulldozer tractors show that the tractor-shovel does the most economical job.

Many general contractors would not be without crawler and wheel mounted tractor-shovels on their operations. The savings realized by using them to clean up the job, place culvert, transport small items such as pumps, bagged cement, concrete and other materials, rehandle aggregate or subbase material, backfill around structures, and handle de-watering equipment, oftentimes pay for the machines on a single project.

The logger is finding that track-type tractor-shovels are providing the most economical solution to many of his problems. One tractor-shovel with the proper attachments can: Clear land and pioneer haul roads, build haul roads including ditches, dig and load gravel to surface roads, remove snow from roads, and sort and load logs.

An examination of the costs involved may help clarify those areas where more than one machine may be used to accomplish the same ends. One is the selection of track-type or wheel type tractor-shovels. Comparison of approximate capacity, weight, power and price shows that unit production costs should be and are comparable where both types of machines can operate with equal facility. (See attached Chart II)

● *Choosing Right Shovel.* The choice of one or the other type will depend on the work to be done, the type of underfoot conditions encountered and, to some extent, on the locations that must be served.

● Cramped city locations present no problem to the highly maneuverable track-type tractor-shovel.

Usually, the wheel type tractor-shovel will be used on dry, firm surfaces:

1. Where work points are scattered and self-propulsion over city streets or paved plant areas is desirable.
2. Where materials to be handled are loose or easily loaded into the bucket.
3. Where work surface is one that must not be scuffed.

The track-type tractor-shovel will be used:

1. Where ground conditions or grades require good traction and flotation.
2. Where materials are firm and not easily excavated.
3. Where maximum lifting capacity and stability under load are required.
4. Where tight quarters demand maximum maneuverability.

Various special track shoes are available for track-type machines to minimize ground scuffing with some loss of traction. If constant movement is not required, track-type machines of 1½ cu. yd. and smaller are readily transported by a small truck and relatively inexpensive tilt top trailers. One cu. yd. machines and smaller can be carried in dump truck bodies.

● *Secondary Factors.* When comparing tractor shovels with crawler-mounted power shovels or clam shell cranes on loading operation, a number of factors other than machine performance enter the picture. The ones that favor use of tractor-shovels are:

1. Frequent moves beyond the distance practical to move a power shovel under its own power.
2. Elimination of one man in crew.
3. Lower initial investment for same cubic-yard-per-hour loading capacity.
4. Lift height requirements within the scope of tractor shovels or too restricted for power shovel.

Conditions favoring the use of crawler mounted power shovels are:

1. Where job situation demands the working of a higher bank or cut than can be handled by a tractor-shovel.
2. Where lift height requirements exceed the limits of tractor shovels.
3. Where the machine is to be operated continuously in heavy, very abrasive rock. Here the continuous movement required of tractor-shovels greatly increases maintenance costs.

● Excavating contractors find the tractor-shovel an excellent tool. Caterpillar diesel HT4 Traxcavator is making excavation for two 10,000 gallon tanks for a gas station under construction at Broadway and Cherry Streets in Tucson, Arizona.

Contrary to a widely held belief, tractor-shovel loading costs are actually lower than those of power shovels where conditions permit the highest possible production rates. Investment per cubic yard of capacity has risen sharply since World II. Tractor-shovels currently require from $8,000 to $10,000 per cubic yard in the 2¼ cu. yd. to 1

● Either bucket or rake equipped machines make excellent land clearing and pioneering tools. HT4 beginning clearing on a job near Cazadero, California.

● The tractor-shovel can compete under some circumstances with a power shovel up to 2½ yd. in size. Caterpillar diesel No. 6 Traxacavator shown.

cu. yd. sizes, while crawler mounted shovels range from $25,000 to $30,000 per cubic yard in the 1¼ cu. yd. to ¾ cu. yd. sizes. Two men crew requirements, higher wages plus the added expense of moving of even a small crawler mounted power shovel, have combined with the higher investment to drive excavating and loading cost of power shovels higher than those offered by tractor shovels. Substantial improvements in the design and manufacture of tractor-shovels have also helped to make this possible. Such improvements are:

1. Better design of and use of materials in engines, clutches, transmissions, brakes and track components has resulted in lower weight to horsepower ratios.

2. Application of unit design principles has resulted in better balance and stability. This permits use of larger buckets in relation to machine size and weight.

3. Advance in knowledge of hydraulic components has permitted use of higher pressures. Pumps are more efficient and longer-lived. Full flow filtering of hydraulic systems greatly increases the life of all components in spite of higher pressures and oil flow rates.

● *Summing Up.* All of this adds up to faster, more powerful tractor-shovels with larger buckets and greater lifting capacities. Ownership and operating costs have not kept pace with these advances and lower unit work costs have resulted.

The tractor-shovel has the capacity to compete with a power shovel up to 2½ yd. size. The power shovel formerly reigned supreme in tough hard-to-dig clay, hard pan, shale, glacial till, etc. However, development of low-priced attachments and design improvements have enabled the tractor-shovel to work in these materials with little loss in efficiency. These developments were:

1. Rear mounted, hydraulic controlled rippers enabling tractor-shovels to excavate almost any tough material up to solid rock.

2. Design of economical replaceable tip bucket teeth that are usually enough to insure good production in heavy, hard clay soils.

3. Adoption by design engineers of the principle of tipping buckets back 30°-40° from the digging position at ground level by the use of hydraulic controls, providing better utilization of bucket capacity. The "fishtail" action of the bucket enables the operator to break up the material, making it easier to load the bucket.

● The savings realized by using tractor-shovels to clean up the job, place culverts, transport small items and perform numerous other functions—often pay for the machine on a single project. Caterpillar No. 6 Travcavator.

New electronic method to aid topo surveys

Mathematical formulas and electronic brains are being called on to survey the three-fourths of the United States that lacks adequate topographical maps.

Research on a new method called Analytical Aerial Triangulation, supported by the Army Engineers Research and Development laboratories, is directed by Prof. Arthur J. McNair in the School of Civil Engineering at Cornell University.

Measurements are first made of points on aerial photographs. Then the geometric relations between the points are computed mathematically instead of using expensive stero-plotting machines. The computed positions provide the facts about ground distances and elevations from which contour maps are made.

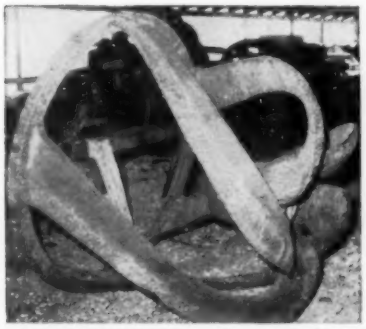
The new method is expected to be twice as accurate as the best ground surveying. Its precision ratio is one to 50,000, a maximum error of one foot in about 10 miles.

The project is using the facilities of the Cornell Center for Integrated Aerial Photographic Studies in the School of Civil Engineering at Cornell University, Ithaca, N. Y.

HOW TO GET LONGER LIFE AND MORE WORK
from your construction equipment

For over thirty years Stoody Hard-Facing Alloys have been accepted as the standard of wear protection, increasing overall equipment life and maintaining operating efficiency. Hard-facing procedures developed by Stoody are thoroughly field tested and proven under actual working conditions in mines located all over the globe. For all-around dependability and maximum wear resistance, no better hard-surfacing materials are made. Use Stoody and you use the best!

POWER SHOVEL BUCKETS are kept in top condition by applications of Stoody 21. Note use of stringer beads on all wearing surfaces.

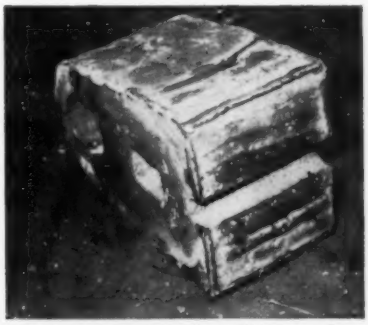


DREDGE PARTS such as the cutter head illustrated, as well as impeller hubs and vanes can be prolonged by hard-facing wearing areas. The part above hard-faced with Stoody 21 outlasted 6 unprotected cutter heads.

CRUSHER ROLLS are easier to maintain with the new Stoody Alloy Tubular Wires applied semi-automatically. Welding is several times faster than with manual electrodes, depositing 7 to 15 pounds of metal per hour.

DIAMOND CORE DRILLING EQUIPMENT including core barrels, flutes and reamers produce more hole when protected with Acetylene Tube Borium. Footage of typical sampling drills was increased from 400-500 feet to 2000-3000 feet in one drilling operation.

CRUSHER JAWS are most efficiently rebuilt with Stoody Manganese and corrugations hard-faced with Stoody 100—both materials are available in the new Stoody Alloy Tubular Wires for semi-automatic welding.



SWING HAMMERS such as this soon lose corners and edges from severe impact and abrasion. Rebuilt with Stoody Nickel Manganese and topped off with a final pass of Stoody 21, life is increased 2 or more times.

You'll find the Stoody Guidebook chock full of ideas for prolonging life of fast wearing mining equipment by hard-facing. Ask your Stoody Dealer for a copy or write direct!

STOODY COMPANY
11925 East Slauson Avenue
Whittier, California

See the STOODY EXHIBIT — WELDING SHOW — Buffalo, N.Y., May 9-11

. . . for more details circle 261, page 16

NEW!
for the FORDSON MAJOR DIESEL

New Ford F.M.D. Industrial Loader has "step-on" design, gives you ½ cu. yd. bucket capacity . . . double-action lift cylinders for down crowd . . . 2000 lbs. maximum load capacity at full lift . . . over two tons of break-away lift capacity . . . 11′10″ maximum lift, 32″ bucket reach. Bucket tilt back holds full capacity loads, and parallel linkage of lift arms keeps bucket approximately level at any lift height. See this high production, fuel-thrifty team in action on your own job!

LOAD A YARD A MINUTE!

NEW FORD step-on INDUSTRIAL LOADERS

for Ford Tractors

Job-proved on applications like your own! Ford's new "Step-on" Industrial Loaders are *all new*, yet they've been field-tested throughout the country by users like yourself, on jobs like your own. You can specify new Ford Industrial Loaders with confidence.

Ample capacity for a wide range of jobs! Ford's new "Step-on" Industrial Loaders are rated at 1000 pounds load capacity at dumping height. They give you over a ton of break-away lift capacity for work in hard or frozen ground.

A selection of job-fitting attachments! You can turn Ford Tractor power into more profit with a quick-attaching ⅓ cu. yd. material bucket, ⅝ cu. yd. light material bucket and fork. Dozer blade and crane to be available soon. There's also a choice of single- or double-acting lift cylinders to fit your individual job requirements.

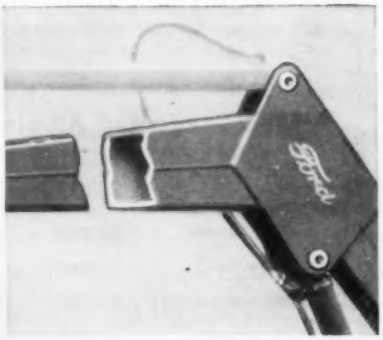
Compare them with any loaders in their class! Check ease of handling . . . better weight distribution means easier steering with Ford. Check ease of operation . . . Ford Loader controls are mounted close at hand for faster, easier operation. Check operator safety . . . Ford bucket design reduces danger of falling material. Check all these advantages and more by contacting your nearby Ford Tractor and Equipment Dealer. Call him now, or write to:

TRACTOR AND IMPLEMENT DIVISION
FORD MOTOR COMPANY
Birmingham, Michigan

CONVENIENT "STEP-ON" DESIGN—Easier than getting into your own car! Open design and wide, low step plates save operator time and effort. A real convenience and safety feature.

. . . for more details circle 211, page 16

HIGH LIFT AND LONG REACH speed loading of high-bodied trucks. Lift is 10'10" from ground to bucket bottom. Reach is 26" from tractor bumper to bucket lip at full height.



RUGGED BOX FRAME CONSTRUCTION Built to stand up under the abuse of shock loading from stockpiles. Dependable service. Less dead weight . . . more payload per pound of loader.

DIGEST of Current Technical Literature

By JOHN C. BLACK, Associate Editor

Cement grout for penetration and filling

This paper relates exclusively to the properties of grout which determine its ability to penetrate and fill openings — (1) flow resistance, (2) plasticity, (3) mobility retention, (4) bleeding, (5) maximum particle size — to the quality of grout after set, and to the means for control of the specified properties. Methods of application and technological details (except for certain tests) are not presented.

Following short discussions of each of the key properties, and the effects of water/cement ratio on quality after set, the author presents recommendations, based on his own experience, for grout characteristics for various purposes, and lists effects produced by certain admixtures. His tables covering these subjects are reproduced herewith. Concerning them he says: "Selection of materials to give a grout with the properties desired for some particular purpose by means of laboratory tests is a tricky matter deserving much care. Nearly every admixture that can be used in grout will affect several if not all the grout's properties. Therefore in making comparisons, it is necessary to test several or all of the properties for a variety of W/C ratios."

Table 2, "Effect of Admixtures," is recognized as very limited. Readers desiring to go into this subject thoroughly are referred to the list compiled by ACI Committee 212, "Admixtures for Concrete," ACI Journal, Oct. 1954, Proc. V. 51, p. 113-148 (also ACI Journal, Sept. 1950, Proc. V. 47, pp. 25-52; Nov. 1944, Proc. V. 41, pp. 73-88).

"Theoretical Basis of Pressure Grout Penetration" by Bruce E. Clark, Geologist, U. S. Army Corps of Engineers, Sacramento, Calif., JOURNAL OF THE AMERICAN CONCRETE INSTITUTE, *18-963 W. McNichols Road, Detroit 19, Michigan, October, 1955. (Price $1.50 per copy)*

Table 1 — Grout Prescriptions for Various Purposes

Grout properties	Finest openings	Large openings only	Long distances	Short distances only	Plug grout leaks
Flow resistance	Low	Medium	Low	Medium	Medium
Plasticity	—	High	Fairly high	High	*High**
Mobility retention	High	High	*Very high**	*Fairly low**	Fairly low
Bleeding	Little	Little	Moderate	Very little	Very little
Maximum particle size	*Very fine**	*Coarse**	Fairly fine (to reduce settlement of coarse particles)	—	Coarse (if openings leading to leak permit)

*Italics indicate the most important property for each purpose.
Note: In nearly all cases, fairly high strength and low permeability are desirable.

Table 2 — Effect of Admixtures on Grout Properties

Admixture	Flow resistance	Plasticity	Mobility retention	Bleeding
Bentonite (1 percent)	Increase	Increase	Reduce	Reduce
Clay (5-15 percent)	Increase	Increase	Reduce	Reduce
Diatomite (2-10 percent)	Increase	Increase	Reduce	Reduce
Lime (5-30 percent)	Little effect	Increase	Slight increase	Reduce
Calcium ligno-sulfonate (¼ percent)	Reduce	Reduce	Increase	Increase (usually)
High-speed mixing	Reduce	Increase	Increase	Reduce

Safety design features of N. Y. Thruway

Accidents on the New York Thruway from its opening in the Spring of 1954 to the end of that year were far below either New York State or national averages — 40.46 personal injuries, 168.2 property damage cases, and 2.44 fatalities per 100,000,000 vehicle-miles; against 305 personal injuries, 587 damage cases and 6.1 fatalities per 100,000,000 vehicle-miles in a comparable period for the state in general; and against 7.0 fatalities for the nation as a whole.

This impressive record is attributed to "design and construction features of the Thruway, the maintenance and operation of the highway, and the Authority program of research and inter-agency cooperation."

Beside such accepted expressway features as fencing, limited access, and freedom from grade crossings, design factors are noted as follows:

3 percent maximum grade.

2 degree maximum curvature.

1000 ft. minimum unobstructed vision.

12 ft. right hand (or travel) lanes.

13 ft. left hand (or passing) lanes.

1200 ft. acceleration and deceleration lanes.

Deliberate introduction of curves at some points to relieve monotony.

Wide center mall (20 ft. to 800 ft.) between opposing traffic arteries.

Special importance is attached to this last feature: "The variable center mall serves three main purposes. It minimizes the danger of head-on collisions, it reduces headlight glare from oncoming traffic, and it relieves the monotony of hypnosis that may de-

velop when a motorist travels along straight, parallel, uninteresting pavement." Opposing lanes are put at different elevations where terrain favors.

Traffic signs and roadside markers are rated high in the safety record. Interchange directional signs range from 4 x 8 to 9-½ x 28 feet. All lettering is white on a royal blue background, both letters and background being reflectorized. Letter height varies from 10 to 24 in. In addition to the interchange direction signs, approximately 12,700 smaller warning, regulatory, and direction signs have been erected on the Thruway and on intersecting state and local highways.

"While not as striking as the large interchange direction signs, roadside delineators are equally, if not more important to the safe movement of traffic. These reflectorized markers outline the path of the roadway far in advance of the drivers' car headlights and have been installed 40 to the mile along both sides of the Thruway. Reflectorized mileposts have also been installed along the entire route. These milepost signs . . . . are used by the State Police, maintenance and operating personnel to pin-point locations or activities along the route."

To meet the many needs for instant communication, the Authority has equipped approximately 250 mobile units with radio combination transmitter-receivers, including snow plows, administrative cars, police cars and emergency service vehicles. In addition, all 196 toll booths, 13 maintenance headquarters and the four division headquarters will be radio equipped.

"Safety on the New York State Thruway" by Arnold G. Fisch, Traffic and Safety Engineer, New York State Thruway Authority, Albany, New York, TRAFFIC ENGINEERING, *Strathcoma Hall, New Haven 11, Conn., October, 1955.*

Soil considerations in Canada

General procedures in the taking and testing of soil samples, and the application of results in highway location, design, and construction are given.

Sampling along proposed routes is generally by hand auger, but diamond drilling is employed where necessary.

Specimens are sent to the Winnipeg laboratory for classification by standard tests of liquid and plastic limits, hydrometer or sieve analysis, etc. The standard classification is an adaptation from the U. S. Bureau of Public Roads standard.

"In the design of the subgrade the soils are considered in relation to the location profile and notes made of all areas where special procedures must be adopted. These include areas of soil unsuitable for use in the subgrade which must be excavated and wasted before construction of the embankment is commenced; areas where soils are susceptible to a high water table and which require the use of a higher than usual grade line; and the locations adjacent to bridges or other structures where the elevation of the structure and the subgrade must be coordinated to allow for future base course and surfacing material. At this stage, too, the question of whether to design for obtaining material for the embankment from side ditches or from borrow-pits is considered."

During construction, available soils data are supplied to both resident engineer and subgrade inspector. This includes not only classification, but Prostor densities and optimum moisture contents. Field control of density is maintained by testing each lift and section of the subgrade as it is built, using the weight of material taken from a small hole in the compacted earth, and a volume measurement of the hole by standard sand. Special investigations by the soils section are made on request from the resident engineer.

Soils information is also used in the design of base courses and surfaces. The general provision that these "shall be such as to carry an 18,000-lb. axle load" is regarded by the author as unsatisfactory. Manitoba has adopted tentatively a group index of soils as a basis for the design depth of base courses under bituminous pavements; and it is noted that this curve is in close agreement with the index design curve developed by Missouri State Highway engineers.

"Influence of Soils on the Design and Construction of the Trans-Canada Highway" by R. N. Sharpe, Province of Manitoba, Highways Branch, Winnipeg, Man. THE ENGINEERING JOURNAL, *The Engineering Institute of Canada, 2050 Mansfield St., Montreal, November, 1955.*

● CUTHBERTSON PROMOTED BY U. S. RUBBER. G. R. Cuthbertson has been promoted to assistant general manager of the tire division, United States Rubber Co. Dr. Cuthbertson, who joined U. S. Rubber in 1936, has been production manager for the division for more than a year. R. E. Behrman, who had been assistant production manager succeeds Dr. Cuthbertson as production manager.

Job and Equipment Ideas

Rubber rail crossing "plate" prove successful

The world's first commercial application of rubber highway-railroad crossing has been installed at West Salem, Ohio. Designed and built by Goodyear Tire & Rubber Company, the rubber units were laid at a highway crossing on the main tracks of the Erie Railroad.

This highway crossing, one of the most heavily traveled in Ohio, receives an almost constant battering from automobiles, trucks, and trains. The rubber slabs provide a smooth, cushioned crossing, thus eliminating a source of major irritation for motorists.

The new crossing consists of slabs of rubber secured by bolts through railroad tie shims to regular roadbed ties. Provided with tapered flanges, the rubber slabs are designed to make a water-tight seal with the rails.

The new technique reduces crossing installation time and the pads can be readily removed and replaced.

An experimental rubber crossing was laid on the Erie line in Akron, Ohio, a year ago by Goodyear. After a winter and summer of tests, the rubber slabs show no apparent wear or deterioration.

Engineers are reported as stating that under normal conditions, the rubber crossings will last indefinitely.

Ditch cut and trimmed in single pass

Tailor-made ditches, finished to exact specifications, can be dug (at least in some soils) by the method pictured here. The machine is a Gradall fitted with a special bucket. Owned by the Howard G. Mercer Construction Company of San Diego, Calif., the machine is ditching to provide drainage in a housing development, under Griffith Company of Los Angeles.

This bucket measures 9 ft. across the top and 3 ft. across the bottom. Its side slope 1½ to 1. The ditch is cut to depths from 3 to 10 ft., preparatory to lining with concrete.

The Gradall here also excavated for headwall and installation of pipe, and helped with positioning of pipe. The same machine on another job was able to remove 5-in. concrete pavement slabs at a rate of 2,600 sq. ft., taking out 450,000 sq. ft. of concrete at a cost of 0.8 cents per sq. ft.

● Ditch cut with special blade, made in single pass preparatory to concrete lining.

● Rubber rail-highway crossing, U.S. 42 at West Salem, Ohio.

● Rubber and steel slabs are locked with lag screws.

Traffic Safety

Construction sign manual

A manual which promises to be of great importance to contractors, construction engineers, maintenance executives and others in highway and street work is now going the approval route.

The "Manual of Signs, Signals and Markings for Highway Construction and Maintenance Work," was prepared by the Engineering Committees of the construction section, National Safety Council.

According to Dale Medsker, chairman of the above committees and now with Southern General Insurance Company at Atlanta, the manual was presented in October to the Institute of Traffic Engineers at their annual convention, and action toward official adoption initiated by this group. On December 7, it was presented to the American Association of State Highway Officials, where action also is still pending. A special committee headed by M. L. Shadburn of the Georgia Highway Department is reviewing the manual and is expected to report on it to the AASHO executive committee at an early date. The manual will be submitted to the various highway departments by the AASHO for a letter vote essential for adoption.

On January 16, the manual was presented to the National Joint Committee on Uniform Traffic Control Devices. This committee voted unanimously to recognize the manual as the official working manual with the provision that any subject change of models be handled through the Committee's subcommittee on signs.

Also the American Association of Safety Engineers at their executive committee meeting in October, 1955, approved the manual in principle and requested immediate action by all parties concerned.

Electronic eyes on parkway

A new electronic system enabling the police at remote locations to observe both the speed and density of automobile traffic is to be tried on the Merritt Parkway in Connecticut.

The equipment, combining radar and electronic computers, will be established on a 4-mile section near Westport.

Designed for better management in research and traffic control the system is the product of Automatic Signal Division of Eastern Industries, Inc., of Norfolk.

OWNER AND OPERATOR AGREE:

Allis-Chalmers HD-16C torque converter tractor works longer, works faster, produces more

Dozing and pulling a scraper in rock-like shale, the HD-16C owned by Murray Construction Co., Waverly, Ohio, is relocating route 73, northwest of Peebles. On one stretch of road, fill being hauled 1200 ft by the 150-hp crawler and a 15-yd scraper will raise highway grade where it crosses a valley.

More Yardage per Dollar

Co-owner Robert Murray has this to say about the new HD-16. "The tractor is a speedy worker and the torque converter is one of the reasons. We also find we haul more yardage for each dollar spent. And the time saved in not greasing track rollers daily should increase our profits."

Operator Kenneth Austin added this: "Our former tractor would stall loading rock like this, but the '16' goes right through. The torque converter saves clutching and makes it a lot easier for me. At the end of a day's work I'm not nearly as tired.

Saves Half Hour Greasing Time Daily

"I get more production because I put in an extra half hour a day hauling and dozing instead of greasing track rollers. I can haul and dump three 15-yd loads in that time and that amounts to 225 yd of extra pay load every week."

★ ★ ★

An HD-16 gives you more power for bigger jobs . . . plus more effective use of power, with a brand new Allis-Chalmers diesel engine and your choice of two great drives — the job-proved torque converter or the easy-shift standard transmission. But that's not all — you get many more advanced basic design features such as all-steel, box-A main frame and one-piece steering clutch and final drive case . . . unit construction . . . and timesaving, simplified lubrication and service designed with better maintenance in mind.

All in all, an Allis-Chalmers HD-16 brings you a top combination of performance and long life with mounted or drawn equipment . . . a higher rate of production, more working time, lower job costs.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

Talk to your Construction Machinery Dealer today

ALLIS-CHALMERS

. . . for more details circle 182, page 16

Dozer-Fed Loader

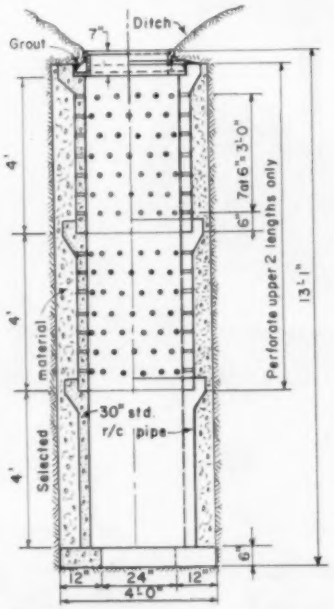
(Continued from page 52)

trimmed. The cut has been removed in horizontal layers to facilitate this slope trimming.

The loader has handled boulders amounting to about 1 per cent of the cut volume for chunks ½ cu. yd. and larger. Most boulders encountered have been thus handled and delivered to the fill. The grid roller would press smaller boulders as big as footballs into the fill, but the larger sizes up to ½ yd. have been windrowed with a motor grader blade end, and the next 8 in. lifts placed around them (see sketch on page 52). This unique operation is accounted for by the specifications which say that fills are to be made in 8-in. lifts, or, lifts equal in depth to the maximum size of rock encountered. Successive 8-in. lifts were made until the boulders were covered up and compacted.

Boulders over ½ cu. yd. which the loader could not handle were left near the loader. When the loader was moved ahead these stones were buried below subgrade and the hole brought to grade with successive lifts thoroughly compacted. The percentage of boulders buried in this manner was small — perhaps 25 to 50 cu. yd. per 250-ft. loader station.

Sometimes also it has been expedient to windrow larger boulders, pick them up with a scraper and place them in a lower fill lift.



● Details of special "dry wells" spotted at various locations along the project.

The hauling units have been well balanced with belt output, the number of units being varied as the haul distance necessitated. The belt has certainly been the key to this progress on this job. Very little time was lost from breakdowns. The belt loader, by the way, was made up by the Spokane Machinery Co.

This interesting job, for which the 4,000 ft. long cut has been largely completed, was shut down for the winter and on resumption in March will be completed by early summer.

Minnesota steps up its letting schedule

Minnesota is among the state highway departments which have made a special effort this year to get contracts awarded earlier.

Bids totalling $5,593,000 were received on 13 projects late in January and 13 additional projects were slated for awarding in February at $4,400,000. With additional lettings planned for March 9, April 6 and 27, May 18 and June 8 and 29, the department of highways is expecting to place about $37,000,000 in new Trunk highway construction by midyear.

To The Editor

To the Editor:

In publishing my paper "Current and Needed Research in Asphaltic Road Materials," in your January 1956 issue, you did well to present a box of "highlights." Many people who do not have time to read a detailed paper are interested in having a general idea of what it covers.

You made one slight error in nomenclature in this highlight summary, which you may wish to call to the attention of your readers. It is the sixth "highlight," on the status of "extraction tests," whereas in the paper I mentioned extraction tests only incidentally in connection with recovery methods.

The recovery of an asphalt from a paving mixture essentially in the condition in which it existed in the mixture involves two steps, as many of your readers know. The first step is to "extract" the asphalt by dissolving it in a solvent, and this presents no difficulty.

The second step is to "recover" the asphalt by removing the solvent so that the asphalt has the same consistency it had in the mix, without altering its essential properties. This is a more difficult operation, and we had no satisfactory method for accomplishing this until Abson developed the method which bears his name.

And now having given you this dissertation, I think I should apoligize for having done so because your error was probably due to haste.

E. F. Kelley
Chief Physical Research Branch
Bureau of Public Roads
Washington

Haste is right. Glad to correct this detail, herewith. — Editor.

To the Editor:

Have read with much interest S. J. Groves' Big Rock Job in the December issue of ROADS AND STREETS.

If at any time, there is a follow-up story on this project, would suggest that Sam Day, project manager, tell the story of the West Virginia coal miners, unemployed on Paint Creek, whom he employed on the West Virginia Turnpike and developed into top drilling crews and who are now with him on the Massachusetts Turnpike. These ex-miners are also on the Clark-Farrell project in Massachusetts.

P. J. Walsh
Executive Secretary
West Virginia
Contractors Association, Inc.
Charleston, West Virginia

The Cause of Gravitation

By Halbert P. Gillette

STUDY of Kepler's empirical laws of orbital motion indicated to Newton what the law of gravitation might be. He put it to a test by calculating how far per second the moon would fall earthward from a tangent to its orbit, as compared with the known rate of a fall of a body near the earth's surface. He expected that those two rates of fall would be inversely as the squares of the respective distances from the center of the earth. On his first calculation the result did not confirm his hypothesis closely enough. But not long afterward a new geodetic survey gave an estimate of the earth's radius which virtually confirmed this hypothesis that the force of gravitation varies inversely as the square of the distance between the centers of two masses. The discovery of a quantitative law, however, is not equivalent to discovering the causative mechanism of the phenomenon. Later on Newton tried in vain to conceive what causes gravitation, and for about 270 years others have likewise failed. However, it does not follow that failure is inevitable, for many a long baffling problem has been solved after either additional factual knowledge had been acquired or a better hypothesis conceived, or both.

The writer has long surmised that a simple quantitative law is due to a simple cause. Yet in the opening paragraph of the chapter on Gravitation in his Electron Theory of Matter (1914), Dr. O. W. Richardson says: "Paradoxical though it may seem, it is quite likely that one of the chief difficulties in the way of a physical theory of gravitation lies in the extreme simplicity of the known laws of gravitative action." He seems to have overlooked that there are several causes of slow progress of scientific research, one of the most common having been the general acceptance of a false hypothesis as if it were a true theory. Attention was called in a July article to what the writer regards as such a case, namely the Rutherford hypothesis that the hydrogen atom consists of a positive proton that has a mass that is about 1,836 times that of the negative electron supposed to revolve orbitally around it. Some facts seem to support that hypothesis, but on last October 18 it was announced by Prof. Ernest O. Lawrence, of the University of California, that with the new multibillion volt bevatron a negatively charged proton had been produced. Shade of Baron Ernest Rutherford!

Even Newton was grossly in error when he decried Huygen's wave theory of light in favor of his own hypothesis that luminous rays are bullet-like corpuscles. Commenting on the effect of Newton's error Poggendorff said in 1867 that there was "no other instance where truth was so long kept down by authority."

If Rutherford's hypothesis had been correct the hydrogen bomb could not have been generated, unless there were some unknown kind of force that overcomes the electrical repulsion between his positively charged protons.

The Magneton Theory

According to the Encylopedia Britannica: "In 1932 Dr. Carl D. Anderson, investigating cosmic rays, discovered a subatomic particle equal to the electron in mass but of oppposite electric charge. This particle became known as the positive electron or positron. It was subsequently shown that a collision between a positron and an electron results in the annihilation of both and their transformation into energy."

Since the writer is inclined to doubt any simple hypothesis that he cannot conceive, he decided to assume that the cosmic positron came from a disintegrated cosmic magneton and became part of the ether. Such an orbital pair would be an *elementary* magneton, which in this article is called simply a magneton, although that term has been applied to other supposed magnetons.

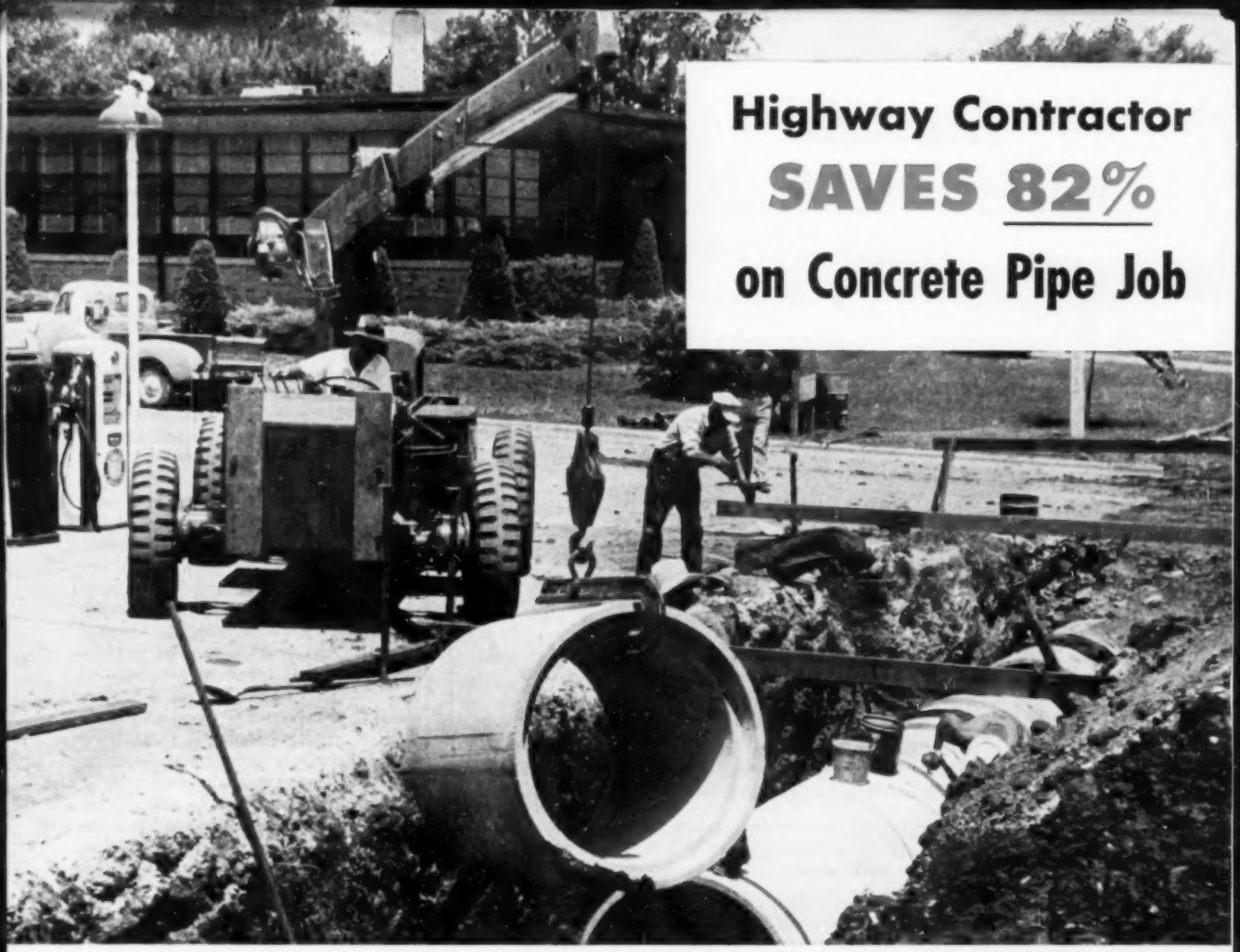
In 1815 William Prout, a London physician, announced that because many atoms had atomic weights that were nearly integral multiples of that of hydrogen, he inferred that all atoms were compounds of hydrogen. His theory met with scant consideration because some atoms (e.g. chlorine) had weights that differed considerably from integral multiples of hydrogen's weight.

The force that causes hydrogen atoms to unite to form grosser atoms is declared by scientists to be one of the deepest mysteries. But if we conceive that the two least massive corpuscles, the electron and the positron, form an orbital pair we may find that Prout's theory involves no greater mystery than magnetism itself.

Call such an orbital pair of electrified corpuscles a magneton. Assign to them the velocity of light, and assume that hydrogen atoms consist entirely of magnetons. Then all matter has internal energy equivalent to half its mass multiplied by the square of the velocity of light. This is just half the energy of Einstein's famous formula, but the two theories differ radically. Einstein assumes that mass is convertible into energy, which is inconceivable; whereas the magneton theory involves no such conversion, but merely the disintegration of some of the magnetons when hydrogen atoms unite. The writer conceives that the force that causes them to unite is the magnetism of the orbitally paired electrons and positrons.

When a cosmic positron quickly disappears, Einsteinists regard it as converted into energy devoid of matter. Instead of such an inconceivable occurrence, the writer infers that the positron either becomes an ether corpuscle or else an orbital mate of an electron in an ether magneton. In addition to such ether corpuscles there probably are other corpuscles, etherites that are electrically neutral. The ether magnetons are oriented toward parallelism by waves of etherites; and when thus pulsating in parallel planes, cause secondary waves transverse to the main waves. This explains the transversity of light waves discovered by Fresnel.

According to this magnetonic hypothesis, the neutral hydrogen atom consists of nothing but magnetons to the number of about 918 with a total mass equal to that of 1,836 electrons. All other atoms, in accordance with Prout's theory, are combinations of hydrogen atoms. The writer regards them as structural systems of magnetons cohering by magnetic force.



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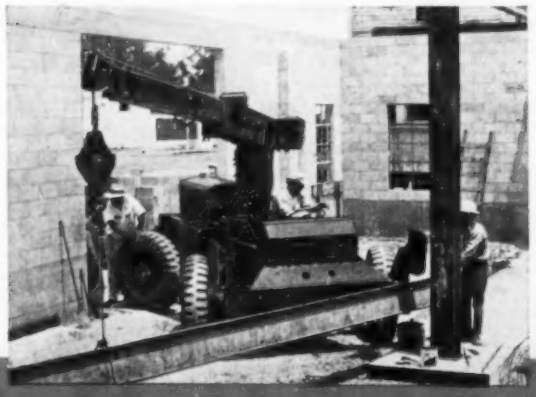

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Molecules are more complex systems of magnetons.

According to Rutherford's hypothesis, the neutral hydrogen atom consists of a positive nucleus, called a proton, and a negative electron, forming an orbital pair. The proton's mass is regarded as not consisting of smaller corpuscles. Sub-atoms called mesons were discovered in 1932 and 1945, having masses about 1/9 and 1/6 that of the proton. Yet Rutherford had regarded the proton as corpuscle not susceptible of disruption.

In Electricity and Matter (1904) J. J. Thomson stated his belief in the then 90-year old theory that "the forces which bind together the atoms in the molecules of chemical compounds are electrical in their origin." But he added: "Chemists in general, seem, however, to have made but little use of this idea, having apparently found the conception of bonds of affinity more fruitful. . . . It may be argued that although we can conceive that one atom in a compound should be positively and the other negatively electrified when the atoms are of different kinds, it is not easy to do so when they are of the same kind, as they are in the molecules of the elementary gases." So even Thomson's brilliance did not save him from clinging to a long held theory that he conceded had poor standing among chemists.

Max Planck announced in 1900 that waves of radiant energy exist in corpuscular quanta whose energy is given by a formula even simpler than Newton's for gravitation. Planck's law is hn, h being a constant and n the wave frequency of radiant waves. In their Astronomy, Russell, Dugan and Stewart say of this law: "Why this extraordinary relation of proportionality between energy and frequency should exist is still quite unknown." The simplicity of the law indicates a simple mechanism. What can be simpler than a system of magnetons consisting of orbitally paired electrons revolving with the velocity of light? The energy of each pulsation of a magneton is here regarded as Planck's constant in his radiant energy formula.

When union of hydrogen atoms forms grosser atoms, as in the hydrogen bomb, the writer infers that magnetons are ruptured and the impacts of their emitted electrons and positrons cause the most stupendous explosion known to man. On the other hand Einstein believes that such an explosion is due to the conversion of some of the mass into energy.

That light is an electromagnetic phenomenon was discovered by Max-

well about 90 years ago, and confirmed by several experiments by other researchers, notably Hertz who, guided by Maxwell's theory, generated radio waves. Maxwell did not believe in a corpuscular cause of electrical phenomena, for although Franklin had suggested such a cause, experimental evidence was not persuasive enough until J. J. Thomson isolated and roughly weighed the electron in 1897. Based on such evidence and Planck's great discovery, the writer conceived the existence of the magneton above described.

The Huygens' Principle is another phenomeon whose mechanism has not been understood, but which is readily pictured by the pulsations of magnetons in the fronts of waves of free electrons and positrons. One of the most generally available sources of information on the Huygens' Principle is the article on Light in the 9th and 10th editions of Encyclopedia Britannica, where Huygens' statement of it is quoted at length. It involves the emission of light waves at numberless points in every wave front. These points are ether magnetons, according to the theory here presented.

In the same issue of Britannica, under Light, Hamilton's Laws of Stationary Action and of Varying Action are presented, but the mechanism that causes the laws is not discussed. It will suffice to say that the interaction of ether magnetons and free corpuscles seem to cause Hamilton's laws, and to indicate that the basic geometricity of form and action in Nature is thus explained. If so it follows that the cause of gravitation must also be magnetonic.

In 1836 O. F. Mossotti published his hypothesis that "Gravitational attraction is an uncompensated residue of electrical forces," as Richardson puts it and more definitely states: "Particles of uncharged matter contain equal and opposite charges, and the attraction between unlike charges slightly exceeds the repulsion of like charges." If so, "gravitational attraction is propagated with the velocity of light."

Although quantitative laws of electrostatic force are simple, the underlying mechanism has been as puzzling as that of gravitation. Only analogy can serve as a guide to discovery of the cause of either phenomenon. Hence electrons and positrons may themselves be orbital systems of less massive corpuscles.

Maxwell inferred from his electromagnetic theory that light exerts pressure, which was confirmed by experiment and is visually indicated by the streaming of a comet's tail away from the sun. Why then, do electromagnetic waves from the sun *attract* a planet? The writer infers that it would not do so if the planet did not emit similar waves. The opposed pressure of these expanding waves increase the density of the ether corpuscles between sun and planet. The velocity of a radiant wave decreases with increased density of the medium. Hence it must be slightly less in the ether between the centers of sun and planet than on the remote sides of their magnetons, whence it follows that the reactive pressure of a wave generated on the remote sides exceeds the reactive pressure on the adjacent side.

In so far as the ether constituents are electrons, positrons and magnetons, they gravitate and therefore must form what may be called electronic atmospheres around celestial bodies. This atmosphere must have a density that increases with the mass of such a body; and it probably explains the atmospheric shells that exist not only inside but far beyond the earth's mollecular atmosphere as shown by reflections of radio signals. It may even explain the heads of comets and the sun's photosphere, corona and at least two other radio wave emitters outside of those two. Evidence of the truth of this hypothesis will be presented in a later article.

The experimental discoverer of the electron, J. J. Thomson, determined its approximate mass which Millikan calculated with great accuracy. If gravitative force is due to a difference between the electric force of an electron and a positron it must be shown how an electron seemingly separated from a positron could be "weighed."

In Millikan's admirable experiment which won a Nobel prize, an oil droplet was charged with one or more electrons. It was projected upward a small distance by electronic repulsion, until allowed to fall through the resisting air. From a droplet's rate of descent with and without an electronic charge the mass of an electron was deduced. But if an electron must be associated with an adjacent positron to cause gravitation, where was the positron in Millikan's experiment? The answer seems to be that each electron in a droplet induces a positron in an adjacent molecule of air. But since a molecule of air merely acts to retard the rate of fall of the oil droplet, there is left only the electric effect of a paired electron and positron to cause a gravitative wave in the ether.

Ether wave mechanism involves a continuous replacement of ether corpuscles in each succeeding wave. Thus viewed a long standing puzzle is solved as to the source of gravitative energy. An article by Clerk Maxwell on Attraction (Encyclopedia Britannica, 9th and 10th edition) states that: "It is remarkable that of the three hypotheses which go some way towards a physical explanation of gravitation, every one involves a constant expenditure of work." He regards this as inconsistent with the principle of conservation of energy; but an ether composed of both dissimilarly moving and wave moving etherites may explain that very principle. Its corpuscles moving with the velocity of light and impinging upon one another cause equipartition of energy such as molecules of gas display. There is, however, a paramount difference between etherites and gas molecules, for the individual etherites are not restrained gravitatively or electrically. Hence any energy transmitted by an etherite in a given region is almost instantly restored in that region by its replacement with another etherite that has acquired the energy of etherites by impacts therewith.

Although the magnetons that constitute atoms are not changing as are those in an ether wave, their orbital electrons and positrons are constantly receiving impacts from etherites that are changing. Thus these magnetons maintain their energy.

As stated in the writer's December article only two of the nine visible planets, Earth and Uranus, are probably harmonic; but there is good evidence that at least four unseen planets have orbital periods that are harmonic. Their periods constitute a geometrical progression series whose ratio is three, a triplex series; and the shortest period of these planets of this triplex series is 672 years which is exactly 8 x 84. The latter is the period of Uranus, if the estimated 84.01323 is exaggerated 0.1323 year (about 4¾ days) due to orbital perturbations caused by the unseen planets whose masses are very great, judged by their cyclic effects. They could not have remained harmonic had the ether caused orbital resistance not compensated by some action. As indicated above the compensating effect consists in constant replacement of etherites in each ether wave.

Michelson's celebrated experiments in 1881 and thereafter showed that the velocity of light is unaffected by the velocity of the luminous body. The corpuscular theory of ether accounts for this fact as merely one due to the velocity of the causative corpuscles whereas scientists, either having no definite conception of the nature of ether yet believing in it, thought it necessary to imagine a shrinkage of atoms in the direction of motion, caused by the pressure of ether through which they were mov-

ing. Such was the conception of Fitz Gerald and of Lorentz, whereas Einstein denied the existence of an ether and also adopted Minkowski's inconceivable proposition that "time is a fourth dimension of space."

Einstein's relativity theory secured general acceptance upon a seeming verification based on his theory, namely that star's light passing close to the sun would be gravitatively deflected a calculated distance. Certain stars were photographed during an eclipse when their rays were close to the sun, and again several months later when the same rays were much farther from the sun. But the sun is now known to be encased in several concentric ionospheres that emit radio waves. The writer infers that refraction of starlight by a solar ionosphere caused what Einstein mistook for gravitation of starlight.

The Earth has a series of ionospheric shells, several of which are far outside its atmosphere as shown by their reflection of radio signals whose "echoes" are heard 15 and 30 seconds after wave emission.

Another confirmation of Einstein's theory is supposed to be found in the fact that the accelerative effect of electrostatic force acting on electrons in a synchrotron decreases greatly when they attain great velocity. But that is precisely what must occur if the electrons are accelerated by ether waves; for as their velocity increases the push of the waves becomes less and less, until when an electron attains the velocity of light the persuing wave exerts no push at all.

The hydrogen bomb has often been cited as evidence of the truth of Einstein's theory, for he deduced that the "internal" energy of matter is mc^2, in which m is the mass and c is the velocity of light. But only a part of the energy is released by the atoms of hydrogen that combine when such a bomb is detonated, and what part is released is not determinable. The magnetons above described have just half the energy given by the Einstein formula, and it is not liberated by an inconceivable conversion of mass into energy devoid of mass. It is caused by the disintegration of some of the hydrogen's magnetons that escape with the velocity of light when the bomb is detonated.

As an aid to future progress the importance of having a correct theory of causation of a phenomenon has usually been grossly underestimated. This is well illustrated in the slow progress of research in several directions until Huygens' wave theory of radiant energy replaced Newton's corpuscular theory; and again when J. J. Thomson's corpuscular theory of electric currents replaced that of two fluids.

Newton's second research rule for guidance in finding causes is inapplicable if inconceivable causes are invoked. That rule, so outstandingly effective in his discovery of the law of gravitation, is: "In as far as possible, the same causes are to be assigned for the same kind of natural effects."

● Worlds' biggest shovel — 90 tons at a load; a Marion machine with Timken bearings.

World's largest shovel

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It will be used in a strip mine operation in southern Ohio by the Hanna Coal Company to lift 90 ft. of overburden from a coal vain.

Two pulleys at the end of the shovel's boom, which turn on four Timken bearings, carry loads up to half a million pounds. The shovel is so large that it uses a permanently installed auxiliary Timken-bearing-equipped crane for the sole purpose of lifting parts and supplies and an overhead traveling crane for maintenance use. The big Timken bearings in the machine will easily handle the tremendous loads imposed upon them.

35 mph in bad weather

A speed limit of 35 mph is being enforced on the Pennsylvania Turnpike when and where bad weather conditions create driving hazards.

Separate signs indicating the lesser rate of travel are constructed to fit over permanent speed signs. They are placed immediately when a dangerous driving situation develops.

This enforcement according to the Turnpike commission may be localized or widespread, depending upon the extent of roadway driving conditions requiring it, and continues in effect until the hazard has been alleviated. Hazardous driving warnings are flashed and relayed almost instantly by means of the Turnpike radio and teletype systems.

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. . . for more details circle 213, page 16

Detergent Shows Promise as Aid in Soil Compaction

MUCH interest has been shown in the use of a detergent type material with water added, as used experimentally in earthwork compaction on roadway construction of the Kansas Turnpike. A query by the ROADS AND STREETS' editor brought the following clarifying statement from J. Bucher, of Howard, Needles, Tammen & Bergendoff, general consultants for the turnpike:

"The material being used by several contractors is a commercial project, SC-100, as manufactured by Compaction Engineering Company, 1 First Street, Los Altos, California. It is a liquid-detergent type material which measurably reduces the surface-tension of the water, The 'compaction-water' so treated does have the capacity to penetrate the soil at a greater rate of speed and be more completely dispersed in the soil.

"A very limited test embankment section was observed by this office on August 10, 1955. The contractor added 1 in 8,000 parts of SC-100 to water, and applied the mixture to 6 in. loose lifts of clay soil. On another section the contractor added plain water. In about a three-hour period the plain water had penetrated about 4½ in. while the SC-100 mixture had penetrated the full 6-in. layer. The record of this strip with regard to percent of moisture and percent of compaction on which identical volume of water and compactive effort was applied, is reported as follows:

	% Moisture	*% Density*
Virgin Soil	16	
SC-100 Mixture	22	105
Plain Water	18	103

"This would indicate a reduced rate of loss through evaporation and increased compactability of the soil treated with SC-100; however, because of the lack of sufficient test data we do not confirm this indication, nor do we have sufficient data on effect of use of SC-100 on soil strength to warrant approving indiscriminate use of the solution."

Farrell Heads Equipment Committee

Fred B. Farrell, chief, highway Cost Section, U. S. Bureau of Public Roads, is chairman of the Highway Research Board's renewed Special Committee on Highway Equipment.

Members include A. L. Donnelly, engineer of road maintenance, Connecticut state highway department; H. H. Harris, ass't chief engineer, Virginia department of highways; Harold F. Hess, vice-president, Construction Industry Manufacturers Association; P. E. Masheter, ass't chief engineer, bureau of construction, Ohio department of highways; and J. F. Tribble, ass't construction engineer, Alabama state highway department.

Morgan J. Kilpatrick, head, Product Cost Unit, Bureau of Public Roads, is chairman of a subcommittee on job management.

Shear Connectors

(Continued from page 68)

of the tests, the stud dimensions recommended as being the most economical for shear connectors were ¾ and ⅞-in. diameters and 4-in. length. For special requirements and where design dictates, additional length studs up to 8-in. or more in length are available.

Other increasingly widespread uses for end welded studs in connection with reinforced concrete are as concrete anchors in curbing and as basic fasteners for window assemblies and other preassembled components in modern fireproof buildings. In the latter case, studs are end welded to steel inserts cast in concrete.

Additional Data

These additional points in connection with South Dakota's experience and with stud shear connectors were furnished by bridge engineer K. R. Scurv. Figure 2 shows typical details for use of ¾ in. connectors for simple composite spans. Figure 1 shows standard details for a typical 60-ft. span, 30-ft. roadway. The details in Figure 2 have been made for direct substitution for the angle shear connectors shown in Figure 1. This substitution is being made at the discretion of the contractor on most structures now being let in this state.

The two structures referred to in the accompanying article were special designs. Figures 1 and 2 show commonly used standards in South Dakota.

The girders 36WF150 shown in Figure 1 would be 36WF174 with a non-composite span under similar loading. Hence there is a saving in girder tonnage at the rate of 44 lb. per lin. ft. of girder, or 176 lb. per foot of span.

The benefits of composite design, as bridge engineers know, can be obtained in any of three ways. (A) Shallower girder of the same weight may be used if head room is critical. (B) A girder of the same depth but of lighter weight may be used if maximum economy is desired and if head room is not critical. (C) Longer spans may be used, using a girder of the same depth and the same weight.

The cost of providing the shear connectors is a relatively small fraction of the saving derived by their use.

The structures referred to in the article are continuous spans and the shear connectors hence are used only in the positive moment areas.

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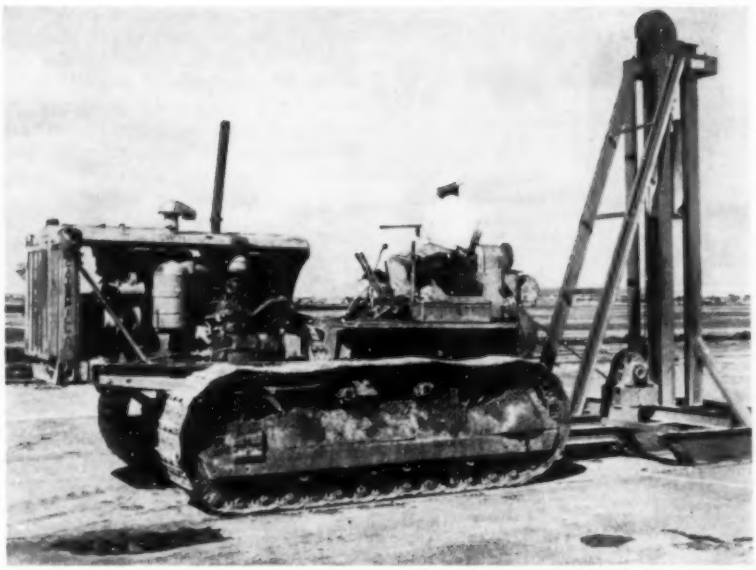
New Heavy Taxiway for Old



● Drop hammer breaking up old pavement. A D8 tractor tows the rig.

Wartime taxiway pavement removed with special breaker, power saws, ripper and dragline.

By Wilbur A. Blain

Area Engineer, Forth Worth District, Corps of Engineers, Fort Worth, Texas

TAXIWAYS at Carswell Air Force Base, Fort Worth, Texas, built during World War II for B-24 traffic, are being strengthened to accommodate heavy bombers now stationed there.

The Fort Worth District of the Corps of Engineers under Colonel Harry O. Fischer, district engineer, is meeting the challenge of 100,000-lb. gear loads with 17 in. of portland cement concrete utilizing 21-in. deep edge sections at contacts with existing concrete pavements. The two busiest taxiways will be strengthened this year under a million-dollar contract with Nolan Brothers, Inc., of Fort Worth, Texas.

Strengthening of taxiways is being accomplished by removing the central 75-ft. areas of two 3,000-ft. lengths of pavement and substituting 17-in. concrete. Engineering studies indicated that in this case it was more economical to replace the old concrete than to overlay it. Construction of a new 17-in. thick concrete warm-up pad and several 5,000-lb. wheel-load blast resistant areas using asphaltic concrete are included in the same contract.

Since the air base is in full operation, all features of construction must be coordinated with essential flight and repair activities of the Air Force. For this reason, construction is scheduled in predefined stages.

Lack of drainage outlets for excavated sections which are completely surrounded by existing pavement demands that the contractor place concrete and base-course while the sun shines.

For this project, the contractor developed a job-constructed drop hammer for shattering the old pavement which has many advantages over the old-fashioned "headache ball." The drop hammer is supported by structural-steel leads mounted on skids for towing. A Caterpillar D8 tractor with winch tows the rig and the winch is used to operate the hammer.

Areas to be replaced are outlined by cutting to 3-in. depth with concrete saws prior to shattering the con-

● Removing shattered concrete to make way for new thicker slab.

● Sawing operations prior to shattering of old concrete.

crete. Curved lines at parking stub turnouts are sawed in 10-ft. chords. After the shattering operation the concrete is loosened with a heavy ripper and the rubble is loaded out by dragline and dump trucks for disposal. The subgrade is then excavated to final grade by use of draglines, bulldozers, and scrapers.

Subgrade preparation calls for compaction of the top 6 in. of existing earth to 90% modified AASHO density, placement of 6 in. of select material, and compaction of the select material to the same density. Compaction of subgrade is being accomplished with heavy sheepsfoot rollers; whereas, a 50-ton rubber-tired roller is employed on the granular select material. Final shaping of the subgrade is done by a subgrade planer which rides the forms. The grade is checked to a tolerance of ¼-in. with a scratch template.

Paving Taxiway

Paving lanes for the new taxiway sections are 25 ft. wide so that three lanes are required for each replacement section. The center lane was selected as the pilot lane for paving purposes. Forms were constructed in 10-ft. lengths by mounting Heltzel 8-in. steel pavement form sections on 9-in. timbers and facing the timbers on the concrete side with a steel plate. Three pins are used to secure each form section in place.

Concrete designed for a flexural strength of 625 psi in 28 days is dry-batched at a central plant located about a mile from the point of placement. Batching of crushed-limestone coarse aggregate and sand is accomplished, using semi-automatic proportioning controls, from standard type Blaw-Knox and Johnson bins, which are loaded from stockpiles by a Lima crane with clamshell bucket. Batch gates on trucks have separate cement compartments which are wind and rain proof to protect the cement during hauling operations.

A Koehring 34-E dual-drum paver, to which is appended a tank trailer for water and a 500 cfm Chicago Pneumatic compressor for serving the vibrators, mixes and places the 2-inch-slump concrete. When the paver is operated on existing pavement, old rubber tires are used as padding for the tracks and skip.

Consolidation and finishing of the concrete proceeds on an assembly line basis. A Jaeger 20 x 25-ft. spreader distributes the concrete between the forms. Attached to the rear of the spreaders is a bank of vibrators on 30-in. centers connected to a common compressed-air manifold supplied by the compressor. The vibrators can be raised or lowered by operating a small winch.

Following the spreader is a Jaeger-Lakewood Type H double-screed transverse finisher, which after two passes is followed by a Koehring longitudinal float. When the floating is completed the surface is hand-finished to ⅛ in. in 10-ft. tolerance by long-handled aluminum straight edges. Surface texture is achieved by one pass of a fine burlap drag operated from a movable bridge. A Flexplane sprayer moving on an endless chain device mounted on a movable bridge then sprays white-pigmented curing compound on the surface to prevent moisture loss.

Final surface testing is done after the concrete has hardened, using a wheel-mounted scratch template devised for this purpose. The method of placing and finishing employed is giving a uniformly good riding surface and very little corrective grinding is necessary.

Although use of either formed or sawed dummy joints is optional with the contractor, Nolan Brothers elected to use the latter method. The firm is using Clipper Consaws with Target ¼-in. composition blades for cutting the joints at 25-ft. intervals to one-sixth of the pavement depth. Experience at the site has indicated the necessity of sawing the dummy joints as soon as the pavement is hard enough to support the weight of the saws and the operators, in order to avoid uncontrolled cracking. The sawed joints give a more uniform riding surface than formed joints and require little or no grinding work.

Sealing Joints

Joints are sealed with special jet fuel resistant compound by use of a Clipper double kettle with pressure attachments. Hot compound from the kettle is forced through a hose with "snorkel" nozzle that fits into the ¼-in. joints for sufficient depth to assure complete filling.

Under blast-resistant areas the top 6-in. of earth is compacted to 95%, a 4-in. subbase to 95%, and a 6-in. flexible base course to 100% modified AASHO density. The surfacing is a 2-in. layer of hot-mix asphaltic concrete placed with a Barber-Greene spreader and compacted to 98% of laboratory density with 10-ton three-wheel, tandem and rubber-tired rollers.

By October 1955, the warm-up pad and one 3,000-ft. section of taxiway strengthening had been completed except for fillets and miscellaneous sections at the parking stub turnouts. The remaining 3,000-ft. taxiway section and blast-resistant areas are expected to be ready for aircraft in the spring of 1956.

Road promotion booklet — aimed for action

The case for better highways and immediate legislative action to get them is well summed up in a pictorial booklet just issued by Caterpillar Tractor Company.

Entitled, "Road Block — What You, as an Individual Citizen Can Do to Get Better, Safer Highways," this booklet is designed to help stir citizens in all walks of life to write their Congressmen, insisting on positive action on highway legislation at this session.

Anyone interested in copies should immediately write to Caterpillar Tractor Company, Peoria, Illinois, or contact the nearest Caterpillar dealer.

Highway Researchers Hear 200 Papers

Over 1,500 technical men attend annual Highway Research Board meeting which set new mark in breadth of subject coverage.

THE highway program which has expanded year by year in construction volume, is also bursting at the seams in its growing technical research. Indicative of this expansion was the Highway Research Board's 35th annual meeting, held in Washington, January 13-17, where a record 1,500 delegates heard more than 200 papers at 36 general sessions. In addition, 67 committee meetings were held.

Commenting on the growth of the Board's activities, retiring chairman G. Donald Kennedy reported that the Board's executive committee has seriously discussed a new name for the organization that would be more expressive of its broadening field.

Among the recent new committees formed, noted Kennedy, is a Committee on Urbanization, organized to meet the need for research into the many problems of American cities. While highway transportation will serve as a prime subject in the study, this committee would get into all the complex and inter-related problems of modern urban living. E. Willard Dennis, a Rochester business leader heads this committee, for which a full time staff director is to be appointed.

The Special Committee on Airfield Pavements, appointed at the request of the Defense Department, will

Stanton Walker receives research honor.

Earl F. Kelley

study the effect of jet aircraft heat, blast and spillage on pavements, with liaison representation from the three service branches.

This brief review will not attempt to cover the many technical sessions, but does single out the rather startling non-technical facts presented on the engineering manpower problem by Carl Fritts, vice-president of the Automobile Safety Foundation. Fritts told delegates:

"State highway departments are recruiting less than a third of the engineers they need. It would take an induction of 2,000 engineers annually, for several years, to meet the backlog of need that has built up."

He gave these examples from a just-completed survey:

- In one state, 15 of the 24 men in the top three grades were over 60 years old. None was under 40. In the next grade down, only 13 of the 238 engineers were under 40 years of age.
- In another state, over one-third of the engineering personnel are over 60 years of age, and only 12 graduate engineers out of a total of 89 qualified engineers are under 45 years of age.
- In a smaller state, only six of the 71 engineers are under 40 years of age. Seventeen of the 71 are already eligible for retirement.

Mr. Fritts recommended that salaries, particularly in the upper brackets, be brought in line with other engineering careers, that long-range programs be drafted to add stability to the profession, and that in-service training be offered to prospective employees.

Kenneth B. Woods, head of the school of civil engineering, Purdue University, was elected chairman of the executive committee of the Board, succeeding Kennedy. Woods is also director of the Joint Highway Research Project at Purdue. Fred Burgraff continues as the Board's director, with headquarters address at

2101 Constitution Ave., Washington, D.C.

Three of the country's leading highway engineers were presented with the Roy W. Crum Award for outstanding research achievement at the Highway Research Board meeting, these were:

- Earl F. Kelley, Chief, Physical Research Branch, Bureau of Public Roads.
- Tilton E. Shelburne, Director of Research, Virginia Department of Highways.
- Stanton Walker, Director of Engineering, National Sand and Gravel Association, Washington, D.C.

Mr. Kelley was given the Award "in tribute to his outstanding record of leadership and sustained achievement in highway engineering and research." He has devoted 46 years to engineering and research work, the major proportion, as chief of physical research, Bureau of Public Roads.

Mr. Shelburne's award was "in recognition of his contributions to the field of highway engineering through his own research, his direction of the research of others, and his extensive professional activity." He is a pioneer in the field of joint state and university sponsorship of highway research, having been one of the first staff members of the Joint Highway Research Project at Purdue University and being now director of the Virginia Council of Highway Investigation and Research.

Mr. Walker was given the Award in recognition of "his outstanding accomplishments in the fields of concrete and aggregates," where he has been prominent for 40 years in research, education and the development of specifications and test methods."

Carl C. Saal, Chief, Vehicle Operations Section, Bureau of Public Roads, was given the Highway Research Board Award for an outstanding paper, "Operating Characteristics of a Passenger Car on Selected Routes."

Tilton E. Shelburne

What's New
in Equipment and Materials

Reader Service Coupon on Page 16

New Galion Motor Grader

Two New Motor Graders

Two new model motor graders, announced by The Galion Iron Works & Mfg. Co., Galion, O., are designated as T-500 (125 h.p.) and T-600 (140 h.p.). Both are equipped with Grade-O-Matic drive which utilizes a torque converter and powershift transmission. According to the manufacturer, these new graders are balanced units, with power and weight engineered and matched to obtain greatest possible "push-power" at the blade — where power means most in moving more material, in quicker cycles.

It is reported that with Grade-O-Matic drive up to 300% torque multiplication is possible on the output drive shaft. Power is automatically applied to the job, in an infinite number of ratios, as needed. A tail shaft governor on the torque converter adjusts the engine speed automatically to meet all loads or condition — at any predetermined working or travel speed. It is stated that power is applied smoothly and automatically, without engine lugging or stalling.

The manufacturer emphasizes that there is no engine clutch nor gear shifting on these new Galion graders. Costly clutch maintenance, time-consuming adjustments, and tiresome use of a foot clutch pedal are eliminated. Instead, on the Galion T-500 and T-600 graders the hard work is done by a four-speed (4 forward and 4 reverse) power-shift transmission. The operator merely moves the finger-tip control levers — either forward or reverse shift can be made while moving in either direction — the Grade-O-Matic torque converter absorbs the load shocks. Operator fatigue is greatly reduced.

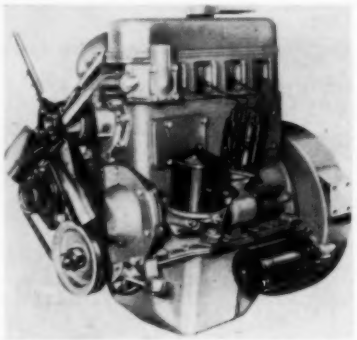
Some of the other standard equipment features of the Galion T-600 grader include a 13 ft. hydraulic shiftable moldboard, same large-size 14.00 x 24 tires front and rear, combination manual and hydraulic booster steering, Galion-designed and Galion-built hydraulic system, foot decelerator, muffler, and four-wheel hydraulic brakes.

For more information circle 106 on Service Coupon Page 16 and mail now.

Hercules Announces 12 New Engines

Mounting dimensions of the new G.O. gasoline and D.D. diesel four cylinder engines are the same. The G.O. gasoline and D.D. diesel six cylinder engines are also interchangeable from the standpoint of mounting dimensions. Since this new series consists of parallel lines of gasoline and diesel engines, they can be used interchangeably, if desired, in any end product within the recommended engine speed ranges. Further, these engines can be built with manifolds and accessory equipment on either side, as the cylinder blocks are symmetrical and can be turned end for end.

Another important feature of these new models is the great number of parts which are interchangeable between the fours and sixes, and also, between the gasoline and diesel. This greatly simplifies the parts and service requirements. The only essential differences between these gasoline and diesel engines are cylinder heads, manifolds, pistons and fuel handling equipment.



Hercules Gasoline Engine Four Cylinder G. O. Series

The horse power ratings of the four series are as follows:

G.O. 4 Maximum HP at 3200 rpm.

Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
G.O. 173	3½"x4½"	173	67
G.O. 198	3¾"x4½"	198	76
G.O. 226	4" x4½"	226	87

G.O. 6 Maximum HP at 3200 rpm

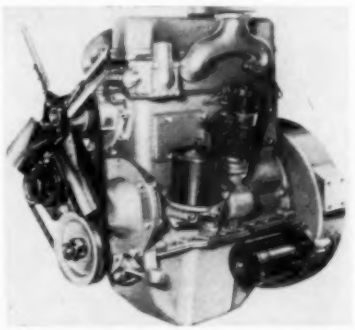
Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
G.O. 260	3½"x4½"	260	102
G.O. 298	3¾"x4½"	298	114
G.O. 339	4" x4½"	339	131

D.D. 4 Maximum HP at 2000 rpm

Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
D.D. 173	3½"x4½"	173	50
D.D. 198	3¾"x4½"	198	57
D.D. 226	4" x4½"	226	65

D.D. 6 Maximum HP at 2000 rpm.

Model	Bore Stroke	Displ. Cu. In.	Max. H.P.
D.D. 260	3½"x4½"	260	75
D.D. 298	3¾"x4½"	298	85
D.D. 339	4" x4½"	339	99



Hercules Diesel Engine Four Cylinder D. D. Series

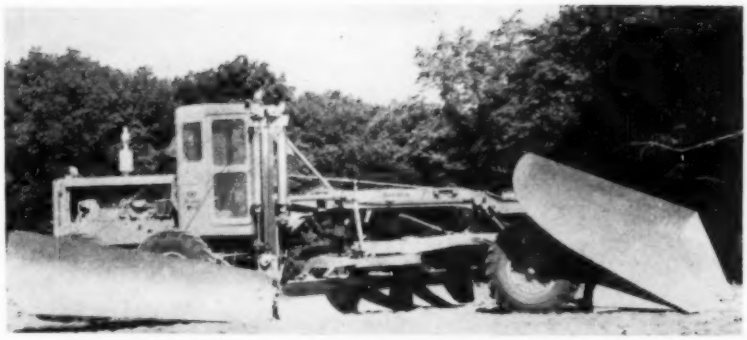
For more information circle 107 on Service Coupon Page 16 and mail now.

Crane Has 21 mph Travel Speed

A Cruiser Crane version of the Model 205 excavator has been announced by the Koehring Co., Milwaukee 16, Wis. One-man operated, the Cruiser has a 15-ton lift capacity, ½-cu. yd. dipper capacity and a top travel speed of 21 m.p.h. for fast shuttle operation. Tests showed that the machine can negotiate 25% grades in low gear.

Economical in operation, the 205 Cruiser is handled by one man from the same control position for both travel and work. One engine supplies all power and a 4-wheel drive arrangement provides the extra tractive power to pull out of trouble at any time. Other features built into the Koehring Cruiser Crane to promote handling ease include power steering, air-hydraulic brakes and a standard torque converter for smooth operation and improved gradability. The unit has a short turning radius, 27½ ft.

205 Cruiser Crane



No. 12 Motor Grader with New Hydraulic Attachments

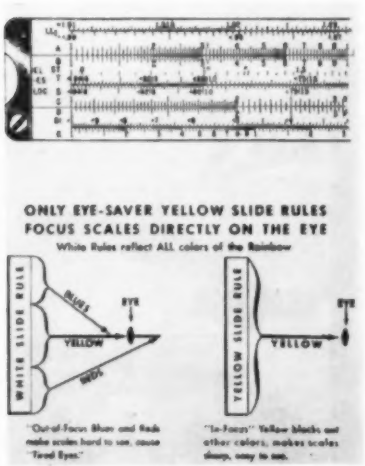
In addition to the 15-ton lift capacity (rated 85% of tipping), the unit can lift a load of 12.7 tons (without outriggers) over the back and travel. For special high lifts, the standard 25-ft. boom can be lengthened to a maximum of 55-ft. plus straight boom jibs of 15 to 30 ft. Safety boom limit stops are standard equipment on the new Koehring Cruiser. Power boom lowering also is standard.

Total weight of the unit 29,400 lb., with the rear axle load without counterweight, listed as less than 18,000 lb., to conform with highway regulations.

For more information circle 108 on Service Coupon Page 16 and mail now.

Green-Yellow Slide Rule Saves Eyes

New light-alloy slide rules made in green-yellow eliminating violet and red rays which focus in front of and behind retina, have been announced by Pickett Eckel, Inc., 1109 S. Fremont, Alhambra, Calif. Green-yellow shade coincides with optimum sight point of the spectrum, cuts eyestrain, blurring and errors in reading calibrations. Non-corrosive, non-rusting metal construction eliminates warping, swelling and binding. Now made in 6 in. and 10 in. Trig, Log-Log standard rules, or in rules made to special order.



Eye-Saver Yellow Slide Rules

For more information circle 109 on Service Coupon Page 16 and mail now.

New Attachments for Cat. Motor Graders

A completely new set of hydraulic attachments for its No. 12 and No. 112 Motor Graders has been anounced by Caterpillar Tractor Co., Peoria, Ill. They are a hydraulically shiftable moldboard, hydraulically operated snow plow and bulldozer mounting and hydraulically actuated snow wing.

The new shiftable moldboard is concave in shape to allow for the hydraulic cylinder. The stroke of the cylinder is 48 in. with 27 in. of travel to the right and 21 in. to the left. Standard moldboards will be equipped with a slide bar in place of the cylinder to allow for manual offset of the blade.

Improved design and strength are featured in the new snow plow and bulldozer mounting. The cylinder is controlled by a four position valve that allows floating but gives down pressure when desirable.

Two cylinders are mounted on the mast to control the cable that supports each end of the snow wing. This type of control, it is stated, will give greatly increased speed for moving the wing around poles, fences, etc.

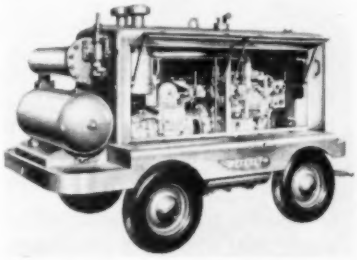
Power for the attachments is supplied from a new enclosed hydraulic system similar in design to other Caterpillar hydraulic units and mounted on the front of the dashboard between the frame members. Valves, located inside the reservoir, can be stacked to allow any or all of the attachments to be used together. These valves include the usual raise, lower and hold positions for the snow wing and moldboard cylinders and an additional float position for the snow wing and moldboard cylinders and an additional float position for the snow plow and bulldozer. Controls for the attachments are conveniently located inside the cab.

For more information circle 110 on Service Coupon Page 16 and mail now.

Compressor Delivers 365 cfm

Conforming to the "new standard" series of air compressor sizes which Jaeger adopted in 1948, the newest Roto Air Plus unit of Jaeger Machine Co., Columbus 16, O., delivers 365 cfm of air instead of the conventional 315 cfm. Outstanding feature of this, and other Jaeger rotaries, is the unusually slow speed of operation. Instead of the usual 1800 rpm its full load speed is 1700 rpm, with resultant fuel savings and lengthened engine and compressor life. At this speed its Model 4-71 G.M. diesel engine operates with ample reserve power.

Instant-acting controls, with continuous, stepless regulation of engine speed to air demands, maintain 100 psi minimum air pressure under all normal working conditions. Over-run and engine-racing are positively prevented. Two-stage compression and tube finned multipass oil cooler are stated to result in air



New Jaeger Roto Air Plus Compressor

temperatures at the manifold 100° cooler than in the most efficient reciprocating type compressors. Eight-hour fuel tank, adjustable radiator shutter, wrap-around bumpers and automotive-type steering front axle are standard.

For more information circle 111 on Service Coupon Page 16 and mail now.

Bit Detacher Modified

A modification in its BD-282 bit detacher has been announced by the Le Roi Division, Westinghouse Air Brake Co., Milwaukee 14, Wis. Used to detach "one use" bits from drill steel, the detachers are now manufactured with a plate covering the bit and the end of the steel, a safety improvement over former models. The detacher can only be operated when the cover is in place, preventing injury from breakage or spalling of bits or steel. The BD-282 detacher is used to remove LeRoi-Cleveland CRD and Vac-numatic one-use bits.

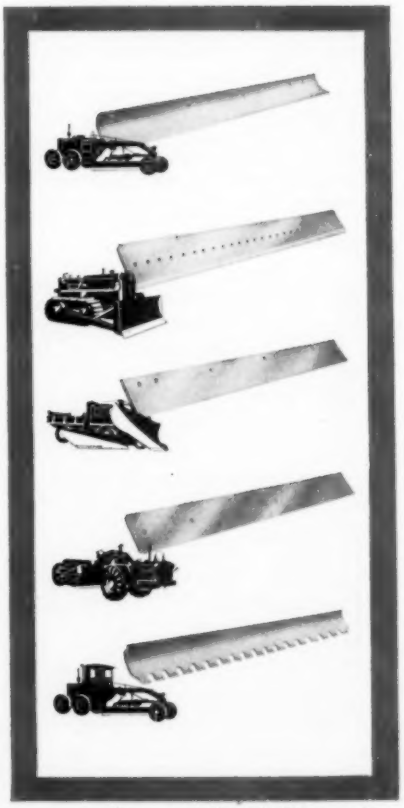
For more information circle 112 on Service Coupon Page 16 and mail now.

LEPRECHAUNS or BLUE OXEN?

Many remarkable tales about construction miracles came out of the early days of the West. Like the ways Leprechauns helped Irish workers build our transcontinental railroads. Or the way Paul Bunyan used his big blue ox, Babe, to turn Kansas under, "a square-mile at a time."

Of course, no man could verify these tales. But there are many men who'll tell you *from first hand experience* about the ways **CF&I** Cutting Edges help modern contractors. They'll tell you about the extra-rugged and long-lived service that **CF&I** Cutting Edges give on dozers, scrapers, graders, snow plows and allied equipment, and that's no miracle.

You'll find that **CF&I** Cutting Edges are supplied in a wide variety of lengths, widths, thicknesses and hole spacings—flat or curved—with beveled or square ends. For full details, contact your nearest **CF&I** Representative.



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3183

CUTTING EDGES

THE COLORADO FUEL AND IRON CORPORATION

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Oakland • Oklahoma City • Philadelphia • Phoenix • Portland • Pueblo • Salt Lake City • San Antonio
San Francisco • Seattle • Spokane • Wichita

. . . for more details circle 205, page 16

HUBER-WARCO MAINTAINER

Helps put *Profit* in variety of jobs

An All purpose— year 'round performer

The Huber-Warco M-52 Maintainer is truly a sensational performer for a wide variety of construction and highway maintenance problems. It will out-perform many machines that are larger, heavier, more costly, slower, more expensive to operate, and more limited in use.

Application of a torque converter reduces shock loads and prolongs the life of the machine. Loads are picked up and carried smoother and faster. Vehicle speed is automatically adjusted to meet load conditions. Wheel slippage is reduced, and the engine won't stall regardless of grade.

A 45½ H.P. engine gives the Huber-Warco Maintainer plenty of reserve strength for the toughest jobs. The unit weighs 6250 lbs. (7205 lbs. with calcium chloride in tires) — enough weight for all maintenance jobs.

With hydraulically controlled attachments, the Huber-Warco M-52 Maintainer will perform service as a bulldozer, lift-loader, side dozer, berm leveler, broom, patch roller, mower or snow plow.

Adding to the efficiency of the Huber-Warco Maintainer is a 9 ft. power sliding moldboard. Easy to reach controls reduce operator fatigue.

Working speeds of the Huber-Warco Maintainer range from 1.7 to 8 m.p.h. Travel speed is 21 m.p.h. for quick movement from job to job.

Get the Important Facts

For complete information, including specifications for the Huber-Warco M-52 Maintainer, and the hydraulically controlled attachments, write for your free copy of Bulletin HWM-512 today.

For a demonstration—see your nearest Huber-Warco Distributor

HUBER W WARCO

HUBER-WARCO COMPANY

MARION, OHIO, U. S. A.

Road Machinery

CABLE ADDRESS: HUBARCO

ROAD ROLLERS • MOTOR GRADERS • MAINTAINERS • GRINDERS

. . . . for more details circle 225, page 16

Backhoe Has Hydraulic "Feet"

Scout D-70-HL Backhoe

Designated the Scout D-70-HL, the new model of Shawnee Manufacturing Co., Inc., 1947 N. Topeka Ave., Kan., is basically the same backhoe as the Scout 70, but is now available with individually controlled hydraulic stabilizers. The stabilizers serve as "feet" and permit the operator to level up his equipment on slopes or when working with one side of the tractor on a curbing. The design of the stabilizers is such that good footing is stated to be assured in all types of soils or surfaces. Perhaps the greatest advantage offered by the hydraulic stabilizers is the ability to level the tractor quickly for digging plumb holes on slopes. Valves on either side of the main valve bank operate the "feet."

It is possible to mount the new Scout D-70-HL on a number of popular-make tractors. It is highly recommended as a companion tool for mounting with the Shawnee "Special" front end loader. This arrangement provides a unique framing structure which actually "cradles" the tractor and relieves the tractor of stresses and strains encountered in heavy digging.

The Scout backhoe digs 12 ft. deep; it reaches 14 ft. and has a digging force of almost 6,000 lb.

For more information circle 113 on Service Coupon Page 16 and mail now.

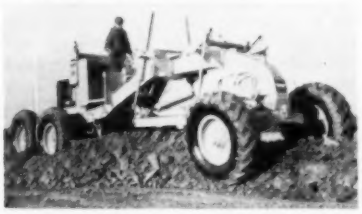
Centralized Lubrication System

A centralized lubrication system for cars, trucks, buses, tractors or any vehicle or equipment having an internal combustion engine, and which automatically delivers a controlled, measured amount of lubricant to as many as 30 lubrication points or bearings each time the engine is started, has been announced by the Alemite Division of Stewart-Warner Corporation, 1826 Diversey Pkwy., Chicago 14, Ill.

The system consists of a vacuum operated pump from which tubing carries lubricant to a positive displacement measuring valve located at every bearing. A single line terminating system, it is energized whenever the ignition of the car is turned on and the engine is started. An indicating light on the instrument panel glows while the system cycles; if it fails to light, it indicates to the driver that there is a fault in the system.

For more information circle 114 on Service Coupon Page 16 and mail now.

Grader Has Converter, Power Shift Transmission



New Huber-Warco Motor Grader

Two new motor graders featuring a torque converter and full power shift transmission, the 140 hp. Huber-Warco 7-D and the 100 hp. Huber-Warco 6-D, have been announced by Huber-Warco Co., Marion, O. On both the 7-D and 6-D, which are similar in design, Huber-Warco's combination of a torque converter and full power shift transmission brings important advantages. These include more usable power, increased ease of operation and positive protection for all machinery. Also, the combination provides greater workload capacity and greater variations in torque output with only four forward and four reverse speeds. The power shift transmission, itself, permits quick shifts under full load at wide-open throttle without interrupting power flow from the engine to the load.

Also standard on both grader models is a power sliding mold board, operated hydraulically from the cab. It allows an operator to power-shift the mold-board out of the way as he approaches a culvert or post and then power-shift it back to its exact former position — all without leaving the cab or slowing his progress.

Complete hydraulic control of every working position, entirely governed from the cab, is another important feature. The operator can attain a high bank-sloping angle up to 90 degrees on either side without leaving the cab. The blade can be rotated 180 degres without removing the scarifier teeth.

Both the 7-D and 6-D boast time and labor saving hydraulic booster steering that retains the positive feel of manual steering. Simplified to operate with a minimum of parts, Huber-Warco's hydraulic booster steering reverts automatically to manual operation in case of a power or hydraulic failure.

For more information circle 115 on Service Coupon Page 16 and mail now.

Vibrating Rollers

Model VR 32 R Tandem Vibrating Rollers

Full scale production of several models of Essick vibrating rollers has been announced by Essick Manufacturing Co., 1950 Santa Fe Ave., Los Angeles 21, Cal. It is claimed that the introduction of these rollers marks the first practical and proved application of sound engineering principles to the theory of "Compaction by Vibration." By utilizing high frequency vibrations, the Essick vibrating roller produces a consolidation of all types of granular materials and asphaltic paving materials.

Designed to suit the specific needs of economy minded contractors, engineers and public officials, the Essick vibrating rollers are produced in three sizes: The 28 in. model VR 28 W hand operated self-propelled vibrating roller; the 32 in. model VR 32 R self-propelled, tandem vibrating roller; and the 54 in. model VR 54 T trailer type vibrating roller.

The model VR 28 W and model VR 32 R vibrating rollers are stated to be highly effective in compacting layers on granular materials from 10 in. to 24 in. in thickness. It is stated the Essick vibrating roller will give compaction in excess of 95%

of the AASHO (American Association of State Highway Officials) tests as modified by United States army engineers.

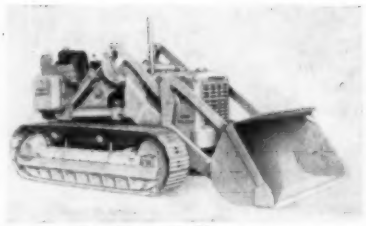
Job performances of the 54 in. model VR 54 T vibrating roller, weighing 3,225 lb., are reported to have shown that this roller produces consolidation of earth fills that exceeds that attained by larger pneumatic tired compactors. The Essick model VR 54 T produces these required compactions, yet is small enough to easily work around the narrow confines of bridges and building constructions.

For more information circle 116 on Service Coupon Page 16 and mail now.

Integrally-Built Tractor Shovel

The advantages of integral tractor and shovel design have been incorporated in the newest and largest Traxcavator in Caterpillar Tractor Co.'s expanding line of tractor-shovels, the new No. 977 Traxcavator.

All of the advance design features that are in the company's No. 933 and No. 955 Traxcavators have been included in this larger version. Such features include unit design, 40 degree bucket tip-back at ground level, good horsepower-to-weight ratio, advanced hydraulic system, large lifting capacity, good balance and stability, improved operator convenience and visibility, fast response to controls, in-seat starting and oil flywheel clutch.



Cat. No. 977 Traxcavator

Utilizing a 2½ cu. yd. bucket, the No. 977 features a differential lever on each of the lift arms which makes possible the 40 degree bucket tip-back at ground level. This feature allows the bucket to retain heaped loads even in loose materials. Lower cycle time is attained since the bucket can be driven into a stockpile, tipped back and a full load obtained in one pass without declutching. Horizontal tractor push and upward hydraulic thrust can be accomplished simultaneously for better breakout action.

The bucket can be alternately tipped and leveled while pushing to help work its way into the material and heaped loads can be obtained at the ground line. The tip-back action also improves stability since the center of gravity of the loaded bucket moves back towards the tractor as the bucket is tipped back. The ability to carry the load in a low position keeps the center of gravity closer to the tractor.

In addition to an automatic kickout on the lift valve, the No. 977 has an automatic bucket positioner on the bucket tip valve. This device allows the operator to move the lever into tip-back position and then release it. The lever will automatically move to "hold" position when the bucket reaches digging position and, in the meantime, the operator's hands are free to work gear shift and steering controls. This position is adjustable to give any desired bucket digging angle. These two automatic kickouts were designed to provide decreased cycle time.

For more information circle 117 on Service Coupon Page 16 and mail now.

New Line International Trucks

The new International Model S-180 with dump body pictured herewith, is only one of a wide range of units now available in the recently announced "S line" of International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. With gross vehicle weight rating of 18,500 lb., the S-180 series is available in 130, 142, 154, or 172-in. wheelbase and is powered by the 137-hp International Black Diamond 282 engine. LPG fuel system is optional. The 150 hp BD-308 engine is available on option, as is power steering. New cab comforts, plus a wide selection of two-tone color combinations, are additional features.

International Model S-180 with Dump Body

The International S line ranges in GVW ratings from 4,200 to 33,000 lb. and includes four and six-wheel conventional and specialized truck chassis. The entire International line, of which S-line models are a part, also includes the well-known R-line starting with the model R-185 and ranging up to 65,000 lb. GVW, a line of cab-over-engine models, and the heavy-duty International "400" line of COE and conventional models with GVW ratings up to 90,000 lb.

For more information circle 118 on Service Coupon Page 16 and mail now.

Rear Dump Trailer

A new Athey PR15- Cat Dw 15 rear dump trailer, announced by Athey Products Corporation, 5631 W. 65th St., Chicago 38, Illinois, U.S.A. has a capacity of 15.6 cu. yd., speeds up to 31.3 mph, right or left angle turns of 90° and simply designed, 3-stage hydraulic hoists which tilt the body 60° for quick, positive ejection of any materials.

The entire loaded unit weighs 84,683 lb. with 37% of the load on big drive wheels of the Cat 186 hp tractors. Engine, tractor, trailer and tires are match-

Athey PR15 Rear Dump Trailer

ed in design to provide low cost performance.

Body is all-welded into one sturdy unit built to handle rock or any other material. Premium, high-tensile steel side plates of ⅜ in. Bottom is of ½ in. steel over 1¼ in. solid oak plank filler over ⅛ in. lower plate. Body is completely reinforced with box sections.

For more information circle 119 on Service Coupon Page 16 and mail now.

New carbide bond* blades cut stocking problems

Consolidated Diamond Tool Corp. has announced that recent laboratory and performance tests conclusively show that the company's new diamond saw blade, like its exclusive tungsten carbide matrix, is non-ductile and therefore, under the high heat and friction of concrete and masonry cutting the new blade will not load-up. This feature means that three bond hardnesses now cover a wide range of performance. Stocking problems for distributors, and in particular dealers, are thereby extremely simplified.

A November '55 survey conducted by the Consolidated Corporation indicates that contractors are benefiting by the new blade's extra life, which results in lower costs. Equally as important, contractors have a far easier job of selecting the proper blade for a specific job, because of the blade's general purpose characteristics. For full information write John Dunlavy, National Sales Mgr., Consolidated Diamond Tool Corp., Dept. 2, 320 Yonkers Avenue, Yonkers, N.Y., — *Pat. Pend.

For more information circle 120 on Service Coupon Page 16 and mail now.

Concrete Breaker Has Interchangeable Heads

A new Model 200 concrete breaker, introduced by Concrete Machinery Ltd., Division of Cutcrete Mfg. Corp., 543 South Tyler Ave., El Monte, Calif., has interchangeable heads for breaking concrete, cutting asphalt and tamping. The unit is a non-pneumatic breaker, capable of 60 strokes per minute, traveling 20 ft. per minute and breaking up to 5 in. concrete. The machine weighs 1,750 lb. and is powered by an 8.25 hp., Briggs-Stratton engine. It is 60 in. long, 29 in. wide and 48 in. high. The breaker head weighs 200 lb.

For more information circle 121 on Service Coupon Page 16 and mail now.

ONE MAN PLACES CONCRETE BETTER, FASTER

with

NEW Homelite Concrete Vibrator Set (HIGH-CYCLE ELECTRIC)

Homelite vibrator runs at 10,000 vpm, best speed for vibrating concrete. Motor holds speed constant, even under full load. Speed never fades.

One simple connection and you're ready to pour with the new Homelite Concrete Vibrator Set. It reduces hand labor, eliminates scaffolding and speeds placement of even the lowest slump concrete.

The high-cycle motor built into the vibrator head makes the Homelite extremely powerful and easy to use. The vibrator head has one-foot handling hose, with polarized, screw-type waterproof connection permanently installed. Any number of 7′ or 10′ lengths of pre-loaded polarized handling hose can be attached *in seconds*.

The high-cycle motor is protected against overheating — even if it runs out of the concrete — and the hi-cycle design eliminates brushes and commutator.

The generator will run two vibrators simultaneously, doubling the placement speed. Heavy-duty cable, available in varying lengths, lets you place the generator in any convenient spot. Only the vibrator is in contact with the concrete and no special scaffolding or cradling is ever needed.

Ask your nearest Homelite office for a free demonstration, or write for Bulletin L-816.

HOMELITE

A DIVISION OF TEXTRON AMERICAN, INC.

7003 RIVERDALE AVENUE
PORT CHESTER, N. Y., U. S. A.

Manufacturers of Carryable Pumps, Generators, and Chain Saws

. . . for more details circle 223, page 16

Equipment Utilization

(Continued from page 83)

many years, contractors employed equipment operators and moved them from job to job, retaining them on a more or less permanent basis. Now, the contractor is many times required to select his personnel at each job site and has little choice, since he must employ them through fixed unions and at varying wage rates. He also cited the lack of qualified operating personnel, and stated that many contractors and some equipment companies and even the operating unions are beginning to establish schools for operators.

Howard, who was a contractor for some years prior to becoming consultant to Caterpillar, cited other examples of contractors' losses on the job. Some of these coinciding with previous comments. Some items which seem relatively insignificant are really important efficiency-wise, i.e., location of the drinking water on the job. If placed too far away from the eyes of supervisory personnel, or away from the job site, it will result in considerable loss in operating time. Another item which should be seriously considered in the placement of maintenance shops. He feels that shops located too far away from supervisory personnel results in poor maintenance and down-time of equipment.

Harris also emphasized the importance to morale of at least one daily appearance on the job of the owner or, in the case of a large company, a high administrative official. He cited an example of one contractor who stated that the presence of himself or one of his administrative men on the job even for a short period during the day saved him five cents per cu. yd. of excavation.

● Harris stated with the tractors indicated that few of them do a real preventative maintenance job. He stated there is much talk about preventative maintenance programs but little done about it. It is his feeling that lack of a preventative maintenance program was causing many contractor's profits to slowly dribble out the bottom of the bucket. He further cited an example of one contractor who had an adequate and well scheduled preventative maintenance program which realized him a 50% savings on a major turnpike job. Discussing another leak in the bottom of the bucket, Harris told of a survey made by an agency to determine what, if any, and how adequate were the cost records kept by contractors. The survey covered 115 contractors and the results indicated that only two out of the 115 had adequate records which would indicate the proper type of equipment to be used on a particular job which the contractor was bidding. The survey indicated the contractors generally have no record to indicate whether rubber-tired or track equipment should be used, capacity used for the yardage required, and equipment cost when placed on job.

One question addressed to the contractors' representatives concerned the fairness of specifications as proposed for the national highway program and did the contracting association think they were fair. The answer was yes.

● A question directed to R. P. Jones concerned the advisability of using pneumatic-tired shovels on construction. Jones replied that since the capacity of rubber-tired shovels, as well as their dimensions were limited, it was not considered that rubber-tired equipment, at least, insofar as shovels and draglines were concerned, were suitable for new construction except on possible rare occasions but that rubber-tired shovels were strictly maintenance equipment.

Craig was questioned as to provisions for earth fills in Ohio and advised that material in place in the right-of-way which contained 8% or less moisture must be used for fill material; however, if a test indicated the moisture content was over 8%, it was optional as to whether or not a contractor would use the material.

In a further question, Moss was asked what he considered to be a fair proportion of equipment investment to earn a dollar return during the construction season. He advised that he considered a 4 to 1 return very good and that had been his experience. That is, he considered that if he completed $4,000,000 worth of work, for each $1,000,000 worth of equipment.

There appeared to be considerable disagreement on this point. Many engineers present felt that this was a rather high return and the question was finally resolved by Radzikowski of the Bureau of Public Roads. The latest criteria established by the Bureau provides that the amount of equipment to support a given program should be as follows: on construction, 50 cents on the dollar; on maintenance work, $1.00 for $1.00.

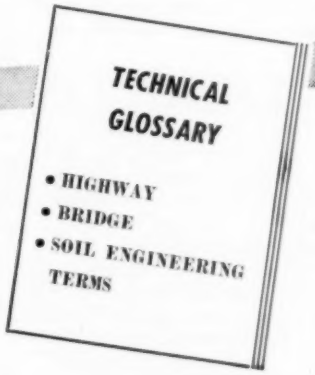
At this stage, although not intentionally, the comments became rather facetious. The question was proposed as to what factor required the greatest amount of time while on the job. Answer No. 1, was equipment breakdown; answer No. 2, was highway department inspectors.

JUST OFF THE PRESS

Technical Glossary — Glosario Técnico

An authoritative book written by the U. S. Bureau of Public Roads on Bridge, Highway, Construction, and Soils Engineering Terms

Authoritative Background Given Below



Here is a book you will want:

- ★ ***20,000 English-Spanish***
- ★ ***17,000 Spanish-English Technical Terms***
- ★ ***Prepared by U. S. Bureau of Public Roads***
- ★ ***Preparation Cost in Excess of $45,000***

TECHNICAL GLOSSARY is a much needed work for use in translating English technical material into Spanish, or Spanish technical material into English, in order to convey the exact same idea and meaning to the reader of either language.

THIS BOOK was in process of preparation for a period of fifteen years. The preparation cost was in excess of $45,000.

The need of a specific glossary or dictionary of terms of this type has long been felt. After several International conferences between representatives of the U. S. Bureau of Public Roads and Latin American engineers, a decision was reached to prepare such a glossary. To further extend its usefulness, soil stabilization and associated laboratory work was included.

The manuscript for this book of over 35,000 terms was over 15 years in preparation under E. W. James, then Chief, Inter-American Regional Office, U. S. Bureau of Public Roads, working with the Library of Congress of the United States. It has been approved by a committee of five bilingual engineers of the Mexican government under the chairmanship of Sr. Ing. J. Fco. Rodríguez Cabo. It was then submitted to and approved by the "Academia Mexicana Correspondiente de la Academia Real Española" under the chairmanship of Sr. Don Martín Luis Guzmán, distinguished author, editor and publicist, also publisher of "El Tiempo."

It was then submitted to the V Pan American Highway Congress where a resolution was adopted commending the venture and recommending that the manuscript be published.

GILLETTE PUBLISHING CO.,
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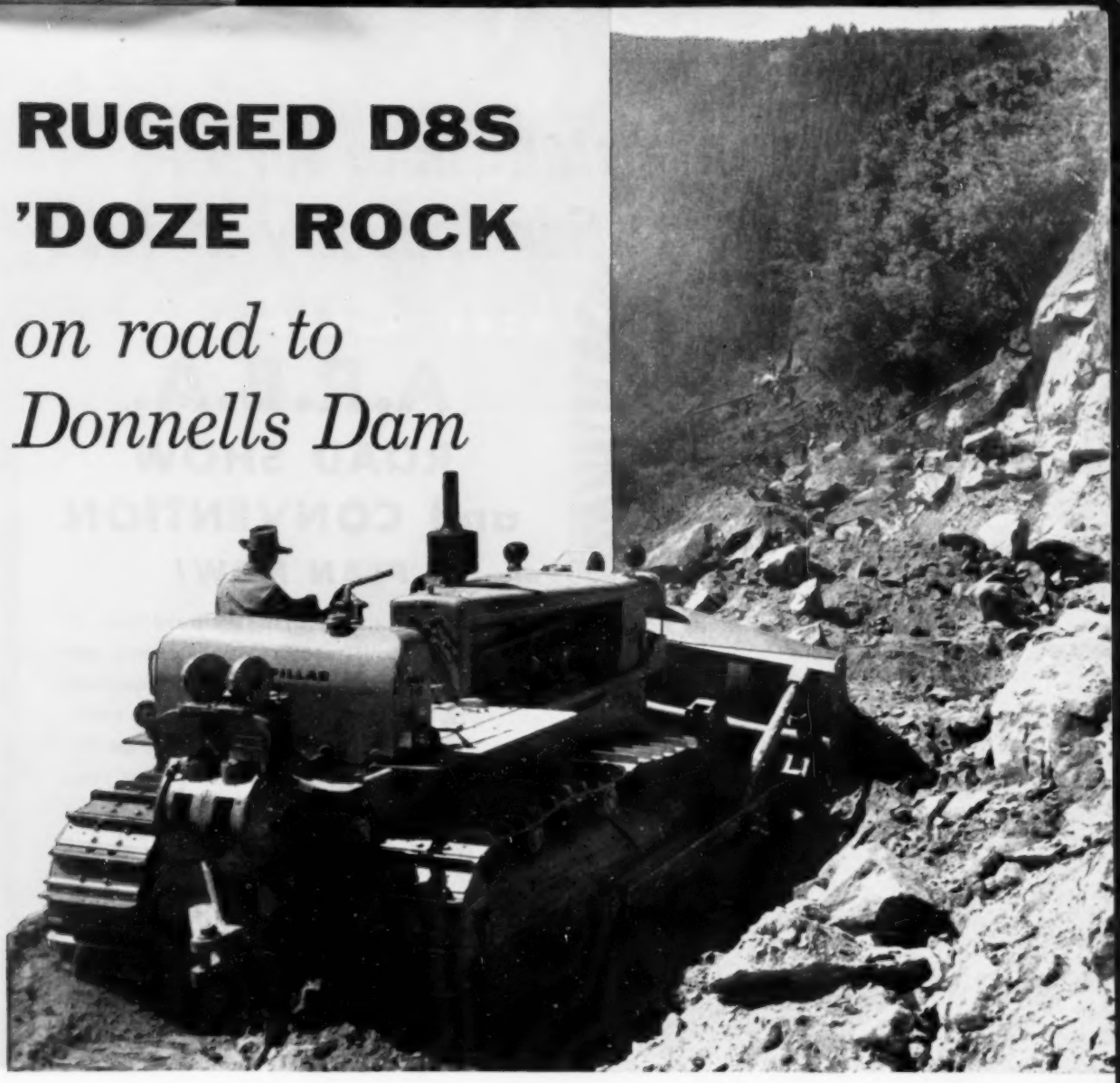
RUGGED D8S 'DOZE ROCK

on road to Donnells Dam



In rough mountain country above Strawberry, California, Tri-Dam Constructors are preparing for the $32,000,000 job of building Donnells Dam.

One of the first requirements is an 8-mile, 24-foot contour road leading up to the dam site and permanent camp. And most of the roadway has to be blasted out of steep granite slopes like the one pictured. Handling shot rock on locations like this takes tough equipment. That's why Tri-Dam is using CAT* D8 Tractors with No. 8S Bulldozers. There are 9 of them working on the project.

The D8 has been known as "king of the crawlers" for years. As jobs grew bigger and tougher, the tractor has grown with them. Today's D8 is new from the ground up—bigger, tougher, more powerful than any earlier model. Look at these features:

- *New heavy-duty 4-cycle diesel engine delivering 191 HP at 1200 RPM.*
- *Choice of torque converter or direct drive.*
- *Oil clutch, for smooth performance and long work life.*
- *New 7-roller track frame and long-wearing "water quenched" track shoes.*
- *New, more powerful starting engine with "in-seat" starting.*
- *Better job visibility and greater operator comfort.*

Your Caterpillar Dealer will be glad to show you how this new D8 can increase your production. And you can depend on him for prompt service and original parts. Ask him for a demonstration today.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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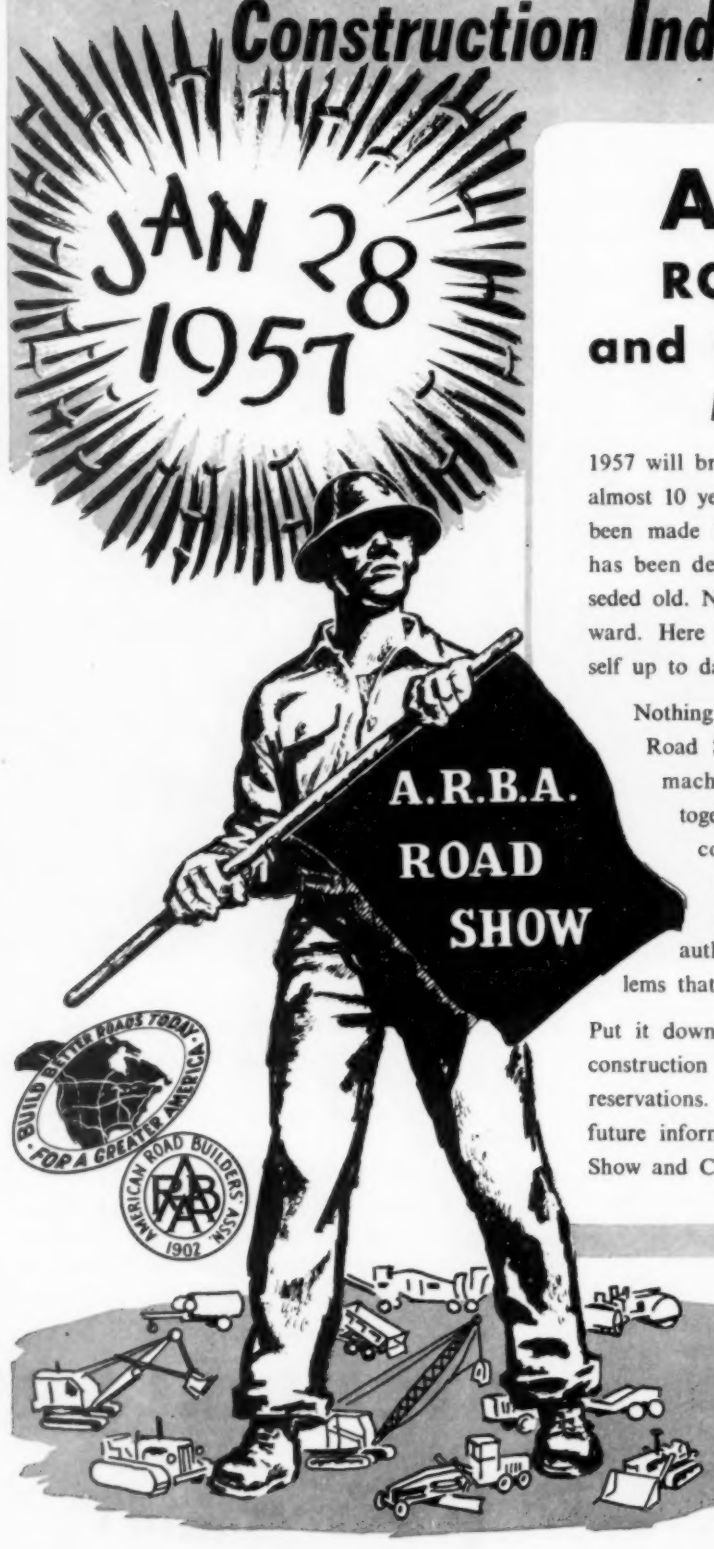
NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

or more details circle 197, page 16

The most important date for the Construction Industry in 1957



A.R.B.A.
ROAD SHOW and CONVENTION
PLAN NOW!

1957 will bring with it the first Road Show in almost 10 years! Tremendous advancements have been made in this last decade. New equipment has been developed. New methods have superseded old. New cost-cutting ideas have come forward. Here is the time and place to bring yourself up to date on all the new developments.

Nothing is being spared to make this 1957 Road Show the greatest indoor exhibit of machinery and materials ever gathered together. At the same time, the A.R.B.A. convention will give you an opportunity to learn about new methods and practices and hear outstanding authorities discuss the solution of problems that are bothering you.

Put it down as the most important date for the construction industry in 1957. Write for data on reservations. Ask to be put on the list to receive future information on the 1957 A.R.B.A. Road Show and Convention.

AMERICAN ROAD BUILDERS' ASSOCIATION
World Center Building
Washington 6, D.C.

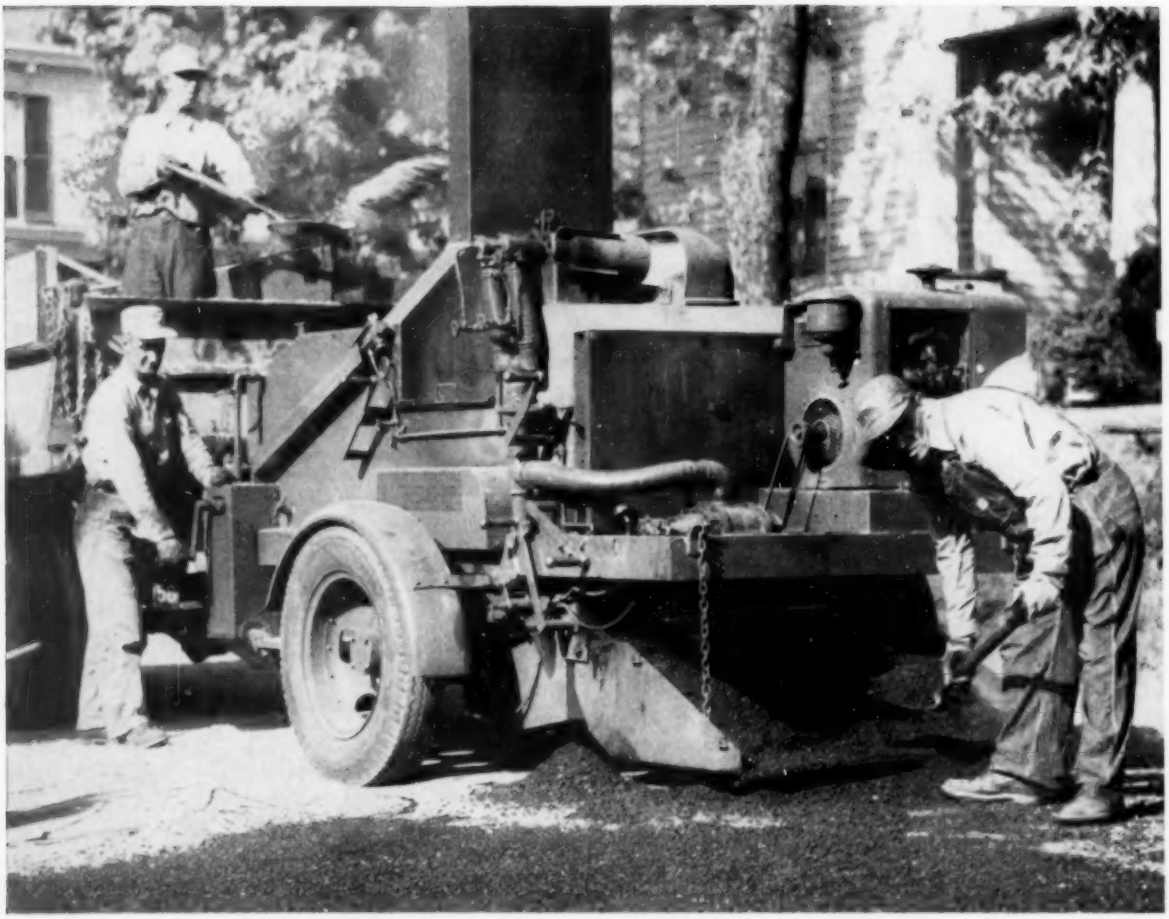
Bituminous ROADS AND STREETS

Published by Gillette Publishing Company,
22 West Maple Street, Chicago 10, Illinois

● A McConnaughay patching mixer at work on a mid-western highway. Equipment designed for better quality control for either hot or cold patching

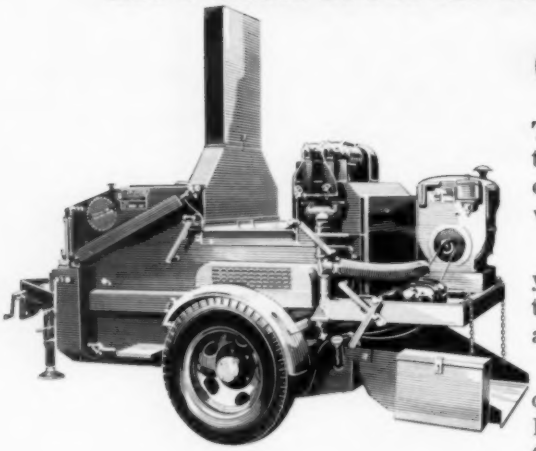
Heavy Maintenance and Resurfacing In Alabama

Trichlorethylene As Extraction Solvent



Give each crew its own asphalt plant

and save $1.82 on every ton!



The Littleford Trail-O-Patcher is a complete, self-contained portable asphalt plant. It's so convenient and economical, you can afford to provide each of your crews with its own bituminous mixer.

In fact, when you consider the $1.82* per ton saving, you can't afford not to keep several Trail-O-Patchers on the job continuously. You can mix as much as you want, anywhere and at any time of the year.

To appreciate the full significance of the increased convenience, efficiency and economy the Littleford Trail-O-Patcher now makes possible in bituminous mixing, send today for your free copy of bulletin 28.

*$7.00 From asphalt plant
5.18 Trail-O-Patcher mix
$1.82 savings per ton

LITTLEFORD *Tops in Black Top!*

LITTLEFORD BROS., INC. 454 E. Pearl St., Cincinnati 2, Ohio

. . . for more details circle 237, page 16

BITUMULS® and LAYKOLD® products for all these paving and surfacing needs

PAVING Bitumuls Base Mixes, Penetration Macadam, Binder and Surface Courses, Armorcoats and Seal Coats, for Roads and Airfields.

TENNIS COURTS – Laykold and Grasstex®. More than 8,000 of these top quality all-weather courts, both public and private, have been built and are currently in use throughout the world.

PLAYGROUNDS—Walk-Top®—the nationwide standard for sealing and smooth-surfacing school playgrounds. (Over eight million sq. ft. of Walk-Top now in place in Los Angeles alone.)

MASTICS – For surfacing floors, sidewalks, garage roof decks and for tile underlayments. Smooth and durable. (More than one million sq. ft. on military floors alone last year.)

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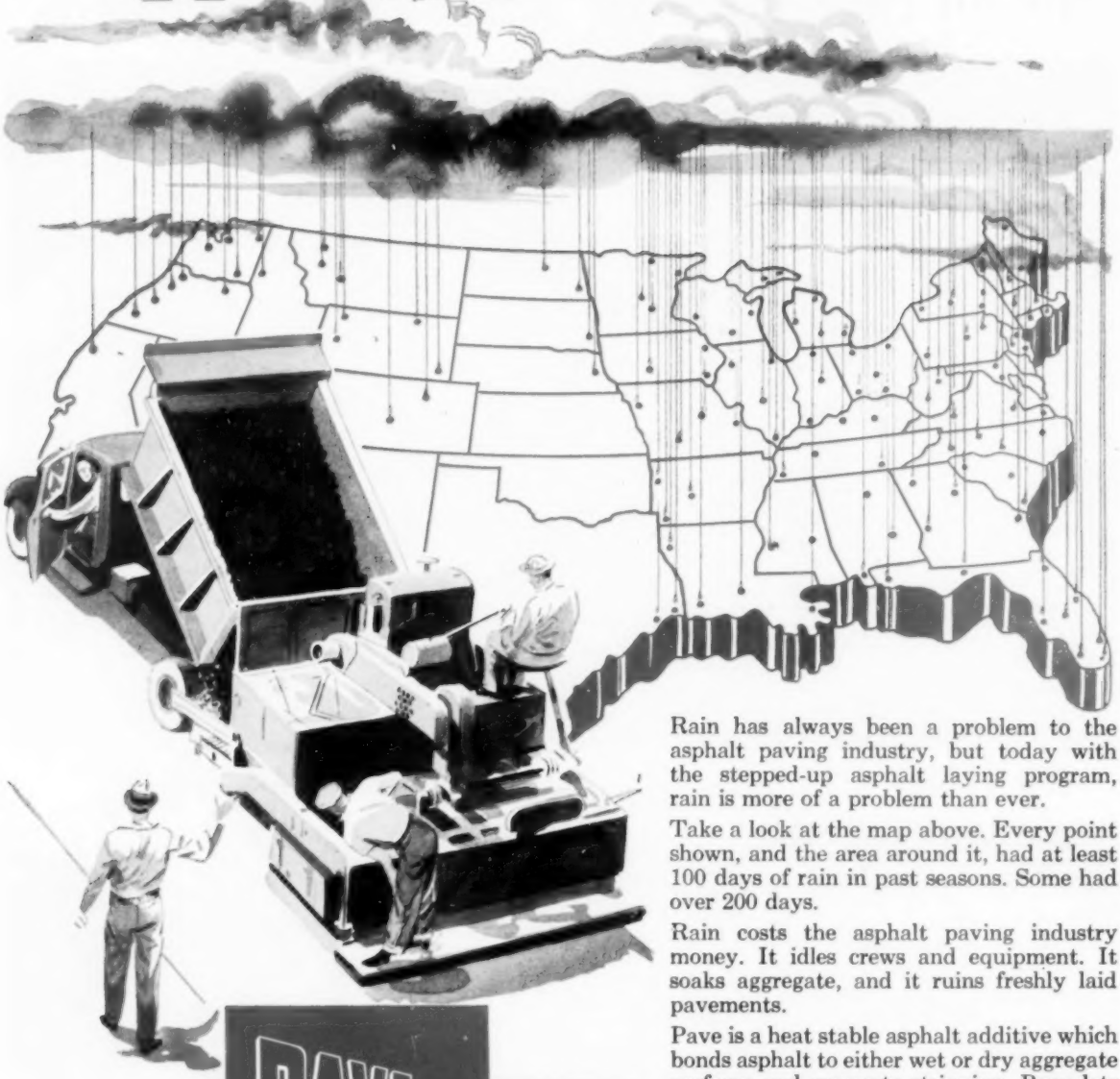
Leading Marketers of Asphalts, Cutbacks, and Emulsions — Nationwide.

. . . for more details circle 184, page 16

IT'S Wetter THAN YOU THINK!



Rain has always been a problem to the asphalt paving industry, but today with the stepped-up asphalt laying program, rain is more of a problem than ever.

Take a look at the map above. Every point shown, and the area around it, had at least 100 days of rain in past seasons. Some had over 200 days.

Rain costs the asphalt paving industry money. It idles crews and equipment. It soaks aggregate, and it ruins freshly laid pavements.

Pave is a heat stable asphalt additive which bonds asphalt to either wet or dry aggregate surfaces and prevents stripping. Pave lets you keep right on laying asphalt during threatening weather. You can lay asphalt right through light showers and right after heavy downpours . . . coat moist aggregate to speed-up mix production.

Start asphalt paving earlier in the spring and lay asphalt later in the fall with Pave. Longer paving seasons mean more asphalt pavement with the same crews and equipment.

Plan to add work days and reduce costs on your asphalt laying program. Consult our Pave Technical Service Department on specific asphalt-aggregate bonding problems.

PAVE HEAT-STABLE

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manufacturers of fine industrial chemicals

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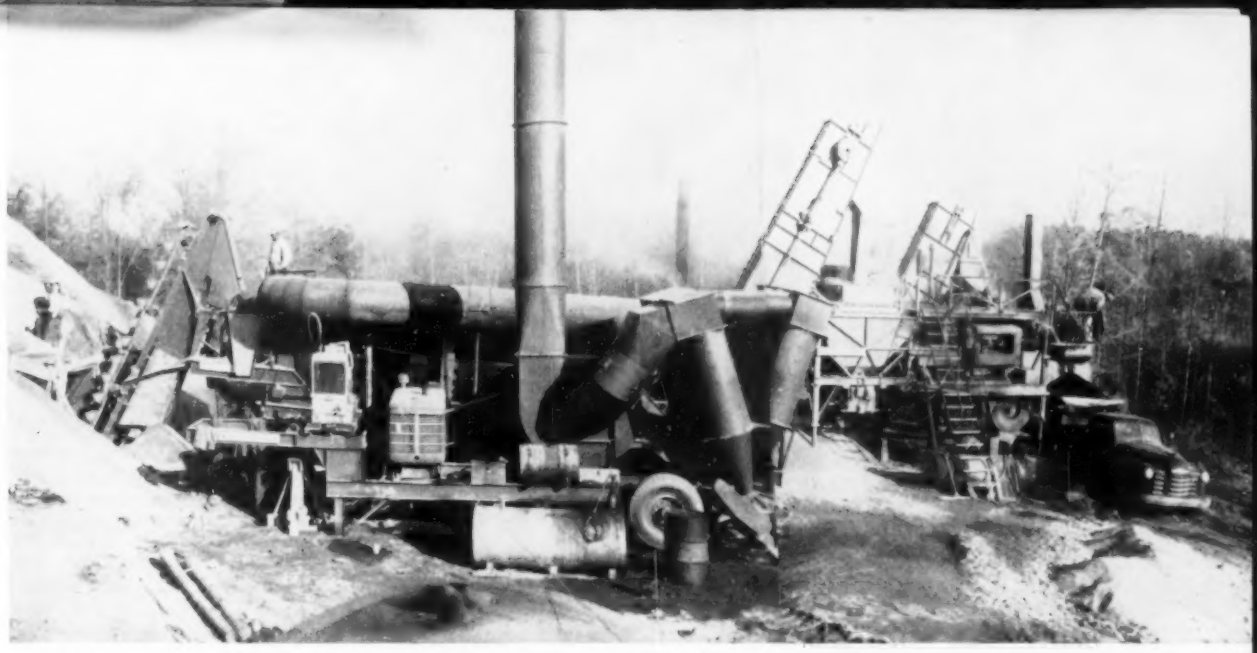


● Bulldozer supplies stockpiled sand to reciprocating plate feeders at left. Hot-mix sand-asphalt is dumped into trucks at right.

Special Project Maintenance By Thin Resurfacing Coat

Alabama state highway department practices accurate plant control of hot-mix for heavy maintenance by the surface-area method.

BITUMINOUS mix is controlled just as accurately in Alabama on special project work as on construction work. In fact the job here discussed might be called construction in many other states.

About 32 miles north of Montgomery on U. S. 231, the Alabama state highway department is resurfacing 43 miles of an old bituminous road to take out part of the high crown and to provide a smooth riding surface. Provision of smooth riding surfaces on all types of roadwork in Alabama is a cardinal principle. To assure this result, considerable attention is paid to the evenness of the base upon which a surface is to be placed.

Maintenance work for truing up an old road in Alabama has become very well mechanized. Briefly, it consists of placing a leveling course to remove irregularities and high crown, and then covering the whole with a thin wearing surface. Procedure will be discussed under the following heads: (1) Construction Procedure. (2) Mixture Control. The latter is extremely important, because the success or failure of the project from the ride-ability viewpoint is dependent upon the close engineering control of production of the mixture.

The state contracts the mixing and hauling, asphalt being furnished by the contractor. All of the rest of the work — stockpiling the sand, spreading and rolling the mixture — is done by state maintenance forces.

● *Construction Procedure.* It should be understood at the outset that the sands used here are local materials. They were dug by dragline from creek deposits not far from where they were stockpiled. Two different size gradations were located and hauled to adjoining stockpiles. At the mixing plant they were bulldozed from the stockpiles against a bulkhead into which a dual reciprocating feeder has been installed. A separating plank wall, at right angles to the bulkhead, keeps the sands apart at the feeder.

The plant is a continuous mix plant with dryer, dust collectors, gradation control unit, mixer and dumping hopper. A bar screen catches and discards large stones, sticks and other foreign matter over the hopper that feeds the dryer. At the dumping end of the hot elevator a 7/16 in. scalping screed removes most stones, sticks, roots and other foreign matter before the dried material passes over the gradation control unit screens. On this set-up there is no set of cold feed bins. The reciprocating plate feeder is set to feed approximately correct amounts of the two sands into the boot of the cold elevator, through the wooden bulkhead which holds back the stockpiles. A bulldozer supplies the feeder.

Properly graded, dried sand is mixed in calculated amounts with an AC 120-150 penetration asphalt in the continuous-flow pugmill, at 275° F. The sand-asphalt mixture drops into a steam jacketed hot-mix dump-

● Another view of the Allied Material Company plant, a Barber-Greene No. 845 unit (90 tons an hour), showing dryer and dust collector. Considerable dust escaped through the high stack as well as around joints, just the same.

ing hopper from which it is dropped into trucks below. The trucks then cart 7 to 7½ ton loads of hot-mix (bodies covered with canvas) to the road and the waiting drag-spreader hopper.

● *Wedge Patching.* Wedge shaped patching is required to build up the edges of the old black-top surface and to cut down the crown. The patching is a continuous wedge, however, one on each side of the center. It feathers from about 1 in to 1½ in. thickness, on the outside edge, to sand grain thickness near the center. Prior to placing this leveling course, the old road surface had been tacked with a fog coat of RC-2 asphalt at the rate of 0.1 gal. per sq. yd.

● *Drag Spreader.* The drag spreader box is a unit made in the highway department shops. At the front is a hopper just a little wider than the truck body. The ends of two steel side rails about 6 ft. long are attached to the hopper and are about 3 ft. apart. At the rear end of the rails an adjustable transom gate is controlled by two hand wheel screws, one on each side. The rear end of the parallel rails is carried on two pneumatic tired wheels. The hand screws adjust the tail end opening of the spreader box. The operator becomes skilled in estimating the amounts of material required as the truck pulls the box forward.

As a loaded truck backs up to the spreader-box hopper, a man attaches the loop tow chain to the hook on the rear center of the truck chassis. The truck dump body is partially elevated after the tailgate is opened over the spreader-box hopper. Here again a skilled operator allows only enough material to slip out of the dump body into the spreader hopper, so that the truck has enough power to pull the spreader. The truck is in the center of the driving lane, and the spreader is centered behind the truck. The spreader box outlet is centered also. The material leaves the spreader box in a band about 3 ft. wide and variable 1½ in. to 2½ in. thickness (as regulated by the box operator). The man who operates the dump body tailgate — in order to keep the load back and allow only a sufficient amount of hot-mix to flow out — is equipped with a long pole on which a hook has been fastened, about 18 in. or 20 in. from the end. He slips this hook over the top of the tailgate and with weight and leverage is able to control the tailgate opening. The leverage idea is something like the idea of the Johnson bar on the old-time wheelers.

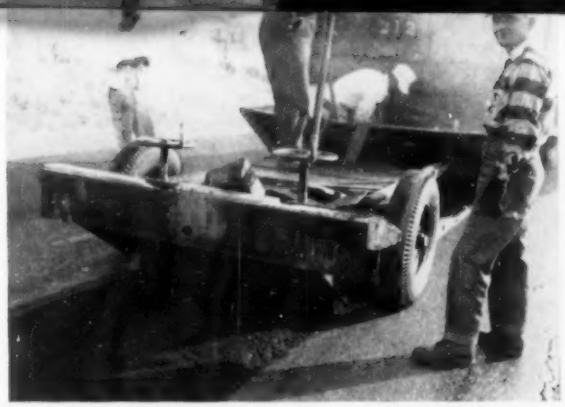
● *Spreading and Rolling.* Two motor graders follow right behind the spreader box. The first grader knocks off about half of the bank thickness of hot-mix left by the spreader. The second gives the final finish from feathered edge at the center to 1 in. to 1½ in. thickness on the edge. On the outside end of the moldboard of each motor grader, the department shop men have attached a removable anti-spilling blade. It is shown clearly in the pictures. This blade is as high as the moldboard and moves along the edge of the old surface. It is level, on the bottom, with the motor grader blade.

Rolling them completes the patching or leveling course. Two 8 to 10 ton tandem rollers operate continuously immediately behind the motor graders.

● *General Data.* The whole outfit completes about 5 mi. of road on one side in an 8-hour day. Approximately an average of 26 lb. of hot-mix per sq. yd. of road surface is used in the leveling course. The plant is rated at 90 tons per hr. and is set at maximum. However, average daily production has been about 400 tons. Each truck load, as it leaves the plant, is driven over a platform scale to get

● Pile of trash thrown out of dried aggregate by the 7/16 in. scalping screen.

● Loaded truck being weighed on Winslow platform scale. G. D. Stinson, plant inspector, shown in front of scaler. Loades average 7 to 7½ tons each.



● Hooking the loop chain of the towed drag spreader onto the chassis of the loaded hot-mix hauling truck on the road. Note that the band of hot-mix left by the spreader is about 3 ft. wide and 1½ in. loose thickness. Operator adjusts rear transom opening as road conditions indicate.

● Spreading the mix. Anti-spilling edge blade attached to the moldboard of each Caterpillar 12 motor grader.

the weight of the load. Asphalt is hauled in 4,200 gal. to 4,700 gal. insulated tankers from Birmingport, site of the American Bitumels Company plant, about 75 miles to the two 12,000 gal. storage tanks at the plant. A third 12,000 gal. storage tank at the plant site contains fuel oil for the dryer and for production of steam. Water is pumped from a creek nearby to the fourth 12,000 gal. water tank. A 65 hp boiler generates steam at 130 psi pressure. A diesel-electric generator set provides power for extra requirements.

● *Surfacing.* The same mix is used for the surfacing as for the leveling course. It is spread with two asphalt finishers working both lanes of the road at the same time and close together. This procedure is believed to give a better center joint bond. It is spread at the rate of 80 lb. per sq. yd., which gives a thickness a little less than ¾ in.

In cool weather, traffic is allowed on the surface immediately after rolling is completed.

● *Mixture Control.* All bituminous mixture on Alabama state highway work, both hot and cold, are controlled by the Bureau of Materials and Tests. On this job the two local sand stockpiles were analyzed for gradation and percentages of asphalt cement to be mixed with these sands were determined by the Alabama surface-area method of mixture design. Specifications allow particular tolerances on gradations per screen. Control is exercised through comparing an extraction test with the specified design mix. Also, daily, and frequently oftener, the sands being fed to the mixer are sieved and checked against the design gradation with tolerances. The asphalt cement content is also calculated and checked against design requirement to see that it does not vary more than is permitted by the specifications. This is a close tolerance and hence the extraction test and mineral material sieve analysis checks are important.

If the gradation of the combined sands vary excessively more than allowable, the reciprocating plate feeders to the cold elevator are reset as well as the openings from the gradation-control-unit hoppers.

Inspectors Procedure. The standard procedure, based on the *surface area method,* is used for controlling the bitumen content of mixtures under reasonable changes in gradation. The term "oil" is used to mean any bituminous material. In this case penetration 120-150 AC was being used. A stand-

440 G

Lab.No.
Bureau of M'tl's.& Tests
P.R.A.
Div.Engr.
Res.Engr.
Proj.Engr.
Bituminous Engr.

ALABAMA STATE HIGHWAY DEPARTMENT
REPORT OF ANALYSIS AND INSPECTION
BITUMINOUS PLANT MIX

Const.Proj.No. 19-011-01a
Maint.Sec.No. 19-011-03d
County Coosa-Elmore
Division 4th
Date 1-10-56

Form BPH-Rev.

Specification Section Sec. 412 Date Tested 12-27-55
Temperature and Weather Condition Cloudy and cool
Producer Allied Materials, Inc., Titus, Ala.
Quantity Produced: (This Report) 362.83 tons
Consigned to: State Highway Dept. U.S. #231

AVERAGE ANALYSIS - TOTAL PERCENTAGE PASSING

Sieve	Job Mix Gradation	Extraction Results 1	2	3		Job Mix Requirements	1	2	3
1"					Specific Surface Area	5.80	6.19	5.73	5.83
3/4"					Oil Ratio	6.81	6.95	6.80	6.83
5/8"					Constant K	1.00	1.00	1.00	1.00
1/2"					Corrected O.R.	6.81	6.95	6.80	6.83
3/8"	100.0	100.0	100.0	100.0	Bit.Req'd.per Ton of Mix	127.5	130.0	127.3	127.7
#4	98.0	97.0	98.0	98.0	Car No.	Loading Temp.°F.	Car No.		Loading Temp.°F.
#10	90.0	91.0	90.0	92.0	Trucks	300°			
#20*	56.0	60.0	56.0	57.0					
#40	25.0	30.0	25.0	25.2					
#80	9.0	10.5	8.3	8.5					
#200	3.5	3.3	3.5	3.6					
Bit.Liq.& Dust Ext'd(% Dry Agr.		7.20	7.00	7.10					
Bitumen Ex.Liq. Theoretical		6.95	6.80	6.83					

PROPORTIONING AND MATERIALS INFORMATION

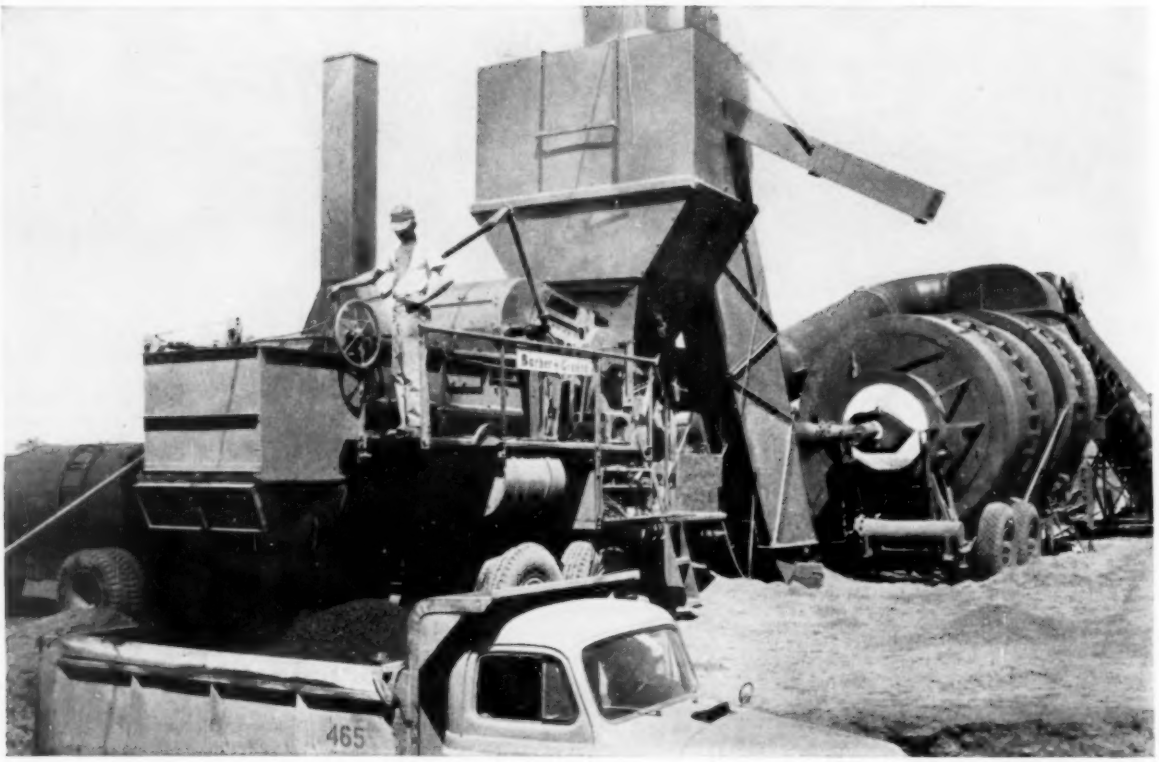
Material	Weight	Source of Supply	Test No.
Aggregate Bin 1	92.68%	Local Pit Run	Material
Aggregate Bin 2			
Aggregate Bin 3			
Aggregate Bin 4			
Hydrated Lime or Mineral Filler			
Bitumen, Lbs.per ton,Grade	7.32%	American Bit. Co.	
Liquefier,Gallons Per Ton of Mix			

REMARKS: This Plant Mix does meet ____ the requirements of the Alabama State Highway Department.

G. D. Stinson Inspector

*Generally, no requirements on these sieve sizes.

● Chart for calculating bitumen content or oil ratio from surface area.



48 hours after this picture was taken, this asphalt plant was operating 70 miles away

In its first season of operation, this Barber-Greene Model 848 continuous plant was moved to six different job sites . . . produced 111,315 tons of quality hot mix in 555 hours of operation for an average of 200 tons per hour.

All plant components are mounted on rubber-tired chassis for over-the-road towing at truck speeds.

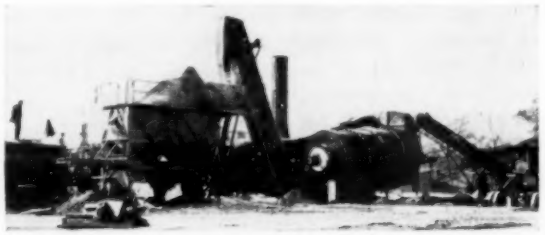
Gradation Control Unit Added

Typical of the many Barber-Greene plant owners, this Minnesota contractor operated with the basic equipment first and later purchased the Gradation Control Unit. He can meet any specification, and has the flexibility of towing the Gradation Unit only to those jobs requiring screening after drying.

Inherently Automatic

Plant operation is based on the Barber-Greene continuous principle which is inherently automatic. Once the controls are set, the plant produces at top efficiency and accuracy.

Barber-Greene manufactures a complete line of continuous and batch asphalt mixing plants with capacity ranges to meet your production requirements.



Same continuous plant with Gradation Control Unit added.

Write for literature on any continuous or batch plant in Barber-Greene's complete line. 56-2-A

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

. . . for more details circle 189, page 16

ard curve or chart for use in calculating bitumen content, or oil ratio from a standardized "Master" gradation for sand with specific gravity of 2.65, and a specific gravity of 1.02 for oil has been adopted by the department. The oil ratio derived by the method is multiplied by a factor "k". The factor "k" to be used for a mix is established from consideration of the particle shape, specific gravity, uniformity of gradation, and absorptive qualities of the mineral aggregate; the kind of asphalt and its specific gravity; the void content of the mix; the type and thickness of the proposed pavement; the stability and shear strength of the mix; the rainfall in the vicinity of the project; the volume and type of traffic; the kind and quality of the base course; the drainage conditions; and the texture required of the finished pavement. It is readily seen that disciplined experience is required in establishing this factor. The factor "k" varies from .80 to 1.10 for different jobs and mixtures.

For standardized sieve sizes of the "Master" gradation, *surface area factors* have been calculated. These are fixed amounts that have been derived from calculations based on theories that have been checked by research. The inspector must use the standard chart or curve for converting total calculated surface area of the combined mineral aggregate into an "oil ratio" figure. This chart is shown herewith. It gives the *surface area factors* for the seven standardized sieve sizes, which have been selected for determining the surface area of the combined mineral aggregate; and also gives a graph showing the relation of surface area to oil ratio.

● One of the Adnum asphalt finishing machines spreading the surface course at the rate of 80 lb. per sq. yd. It will compact to less than ¾ in. thickness.

Example of Calculation of Surface Area

Sieve Sizes	% Passing Cumulative	Weight of Material Between Sieves Sieve Sizes	%	Surface Area Factor	Surface Area
A	B	C	D	E	F
½"	100.0				
⅜"	81.1				
No. 4	54.3	½ - 4	45.7	3.2	146
10	38.2	4 - 10	16.1	6.4	103
40	14.4	10 - 40	23.8	19.8	471
80	5.5	40 - 80	8.9	81.5	725
200	2.10	80 - 200	3.4	182.0	619
		Minus 200	2.1	615.0	1292
		Totals	100.0	907.9	3356

● Wedge-shaped patching and leveling course is continuously rolled by two 8 - 10 ton Galion tandem rollers behind the motor graders.

The oil ratio is defined as the weight of bitumen used divided by the weight of the aggregate, the result being multiplied by 100.

As stated, to obtain the oil ratio, make a sieve analysis of the mineral aggregate in the total mix. The aggregate must, of course, be obtained from the extraction test. A Rotorex extractor is used in the field office. Aggregate retained between each sieve size is calculated as a percentage of the total aggregate. These figures are multiplied by the surface area factor for each sieve size, and then added together to get the total surface area of the mix. The accompanying table shows these calculations.

Table Explanation. Column A gives the sieve sizes. Column B is the tabulation of the regular sieve analysis. The ⅜ in. sieve is not considered for the purpose of this formula as all material is passed over a 7/16 in. scalping screen. Anything larger than the No. 4 sieve is grouped and uses the same surface area factor of 3.2. Column E gives the surface area factors which are used regularly for each fraction of the material between certain sieve sizes. These figures are constant and

Equipment List for Special Project Maintenance

1 Etnyre 1,000 gal. distributor (state owned)
1 Drag spreader (state made)
2 Galion 8-10 ton tandem rollers (state owned)
2 Caterpillar 12 motorgraders (state owned)
2 Adnum asphalt finishing machines (state owned)
1 Barber-Greene No. 845 asphalt plant (contractor owned)
4 12,000 gal. tanks (contractor owned)
1 Caterpillar D6 bulldozer (contractor owned)
1 65 hp steam boiler (contractor owned)
1 Diesel-electric generator set (contractor owned)
1 Winslow platform scale (contractor owned)
12 to 20 2½-ton dump trucks (rented)

are used for all cases. Column F is the result of multiplying Col. D by Col. E. In Col. F the decimals are neglected, the numbers being entered to the nearest whole number.

In Col. D, the figure 45.7 is obtained by subtracting 54.3 from 100.0; 16.1 is the result of subtracting 38.2 from 54.3; etc. 2-1 is all of the material passing the No. 200 mesh sieve.

Oil Ratio. The total surface area so obtained is picked out on the curve of the chart, as shown. The total surface area of 3356 is converted to thousands, 3.356, to conform with the chart. The nearest interpolated point is 3.36. The oil ratio is read at the right, 5.73.

The oil ratio so selected is multiplied by a factor "k" to obtain the bitumen content. The bitumen content is the percentage by weight of the total amount of mineral aggregate and may be expressed as the number of pounds of bitumen per 100 lb. of mineral aggregate.

For the job under discussion, the "k" factor set by the bituminous engineer was 0.85. This was later raised to 0.9 because it was found that some of the minus 200 material was going through the filter in the extraction test and *ash* was a greater amount than anticipated in design. Hence the bitumen content used in the mix 5.73% (oil ratio from the chart) XO.9 or 5.16% which is the corrected oil ratio.

From the aggregate blending calculations the inspector knows the weight of sands per unit volume. He adjusts the asphalt metering as the gradation fluctuates, to keep the corrected oil ratio bitumen content going into the mix.

Personnel. The contractor for preparing and hauling the hot-mix is the Allied Materials Company, Greenville, Alabama, Mr. Dement, superintendent. Their contract price on this job is $6.50 per ton.

For the state, the plant inspector is G. D. Stinson, materials engineer I; the plant calibrator and field engineer is M. L. Vaughan, materials engineer II, and general supervision of materials, tests, plant control and supervision, testing engineer, Bureau of Material and Tests. George W. Phillips is chief engineer, Bureau of Maintenance. Paul Woods is superintendent of the maintenance job here described.

WASHO Road Test Motion Picture Available

The Bureau of Public Roads has produced and released a motion picture, THE WASHO ROAD TEST, depicting the operation and major findings of the large-scale road test undertaken cooperatively by the Western Association of State Highway Officials, the Bureau of Public Roads, and the motor-vehicle and petroleum industries, and conducted under the direction of the Highway Research Board. The object of the test was to determine the effect of heavy traffic on bituminous pavements, especially built for the purpose near Malad, Idaho.

In essence, the test was planned to compare the performance of different designs of bituminous pavements, all laid on a uniform soil subgrade, under controlled truck traffic of varying axle arrangement and load. Traffic operations ran from November 1952 through May 1954. Analysis of the countless data obtained with a wide variety of tests and instruments, some newly created for the job, continued for more than a year thereafter. The design, construction, and testing procedure of the Road Test are fully detailed in HRB Special Report 18, and the test data, analyses, and findings in HRB Special Report 22, both published by the Highway Research Board, 2101 Constitution Ave., N. W., Washington 25, D. C.

THE WASHO ROAD TEST motion picture (16-millimeter, color and sound; 35 minutes) was produced by the Bureau as a visual summary of the published reports, with the authorization and endorsement of the WASHO Advisory Committee of the Highway Research Board.

The film may be borrowed by any responsible organization upon application to the nearest office listed below. There is no charge for such loans except for the shipping costs. Loans can be made only for short periods of time. Several alternate dates should be proposed, and the request should be made well in advance of a planned showing.

WASHINGTON, D.C.: Research Reports Branch, Bureau of Public Roads, Washington 25, D.C.

PORTLAND, ORE.: Division Engineer, Bureau of Public Roads, 753 Morgan Bldg., 720 S. W. Washington St., Portland 8, Ore.

SAN FRANCISCO, CALIF.: Division Engineer, Bureau of Public Roads, 102 Old Mint Bldg., 5th & Mission Sts., San Francisco 3, Calif.

Those who wish to purchase prints of the picture should write to R. E. Royall, Chief, Research Reports Branch, Bureau of Public Roads, Washington 25, D. C., for authority to do so and for information on the purchase procedure. Prints will cost about $130 each. Do NOT send money to Public Roads. The request for authority to purchase prints must include the following statement:

"Assurance is hereby given that the composition of the motion picture will not be altered in any way, either by addition or deletion, and that it will be shown only in its entirety."

No school bells here

The field staff of S. J. Groves and Sons Company on the Massachusetts turnpike go to school every day, but the teachers have long since gone.

Pictured here is the schoolhouse, abandoned for educational purposes and currently used as field headquarters for the Groves organization on their $9,000,000 Massachusetts Turnpike project.

S. J. Groves' Massachusetts Headquarters

Trichlorethylene As Extraction Solvent

Trichlorethylene is being used more universally as an extraction solvent in the analyses of asphalt mixes, notes a summary by Miller-Warden Associates, consultants.

The reason for this development is that the chemical has certain all-around properties that lend advantages over the other solvents. Its comparatively low toxic properties, its excellent solvent action and its competitive cost illustrate this when comparison is made with carbon tetrachoride, carbon disulfide and benzene. This pertains to usage for the determination of per cent of asphaltic binder in mixes but not for use where the asphalt is to be recovered for other tests.

The toxic properties of these solvents were reconsidered at the April 1955 meeting of the American Conference of Governmental Industrial Hygienists. At this meeting the threshold limit (below which a given stimulus ceases to be perceptible) were established as shown below. These values are given as ppm (parts of vapor or gas per million parts of air) as the maximum atmospheric concentration (MAC) of contaminants to which workers may be exposed for an 8 hour working day without injury to health. Other substances are included here for illustration.

Substance	*MAC (in ppm)*
Ammonia	100
Benzene	35
Carbon dioxide	5000
Carbon disulfide	20
Carbon monoxide	100
Carbon tetrachloride	25
Chlorine	1
Chloroform	100
Ethyl ether	400
Naphtha (petroleum)	500
Phosgene	1
Sulfur dioxide	10
Trichlorethylene	200
Mercury	0.1

From this it may be noted that trichlorethylene is relatively less toxic than the other three solvents ordinarily used.

The comparative solvent power of these solvents was illustrated by Brown (AAPT 10, 1939). Trichlorethylene is a better solvent for asphalt than either carbon tetrachloride or benzene but slightly poorer than carbon disulfide. The magnitude of difference here is not great.

Trichlorethylene is non-inflammable at ordinary temperatures. At high temperatures with high concentrations of solvent in air it is considered to be weakly combustible. It is stable at its boiling point (188°F) and up to 55°F above its boiling point. It is well known of course that carbon tetrachloride is non-inflammable with stability up to a few degrees above its boiling point. On the other hand carbon disulfide and benzene are highly inflammable even at room temperatures.

From the cost standpoint trichlorethylene is nearly comparable with carbon tetrachloride when purchased in 50 gallon drums.

Material	*Cost/Lb.*
CC/4	$0.12
C_2HCl_3	0.1375
Lbs./Gal.	*Cost/Gal.*
13.2	$1.60
12.2	1.68

Again considering the all around properties it is quite logical to see the preference for trichlorethylene over the other solvents. Many laboratories have been using it for years whereas others have adhered to the use of carbon tetrachloride not knowing that these differences existed.

Court Decisions

Warning signals on construction streets

By William Hurd Hillyer

California furnishes a case with heavy damages assessed, which points to the importance on construction jobs of "sounding a warning" and stresses the point that *watchful* driving of construction trucks is not enough.

A county highway was being resurfaced along an 8-foot strip with "black top," when a truck on the job backed into and killed a "stringman" who was stretching a guide-cord in front of the distributing machine. His widow brought a damage suit against the driver of the truck and its registered owner.

The facts were undisputed. The distributing machine was in continuous motion with its usual din, being fed by six trucks, one of them the vehicle in question. The offending truck was backing slowly towards the distributing machine when the accident occurred. At that fatal moment the truck's operator was sitting on the edge of his seat, his right foot on the accelerator and his left on the running board, while guiding the truck and looking backward. From such a position, he was unable to see the right rear of the truck, which was the part that struck and ran over the stringer, whose back was turned at the time.

Statutory law requires that trucks used to haul dirt, rock, concrete or other materials shall be equipped with sounding devices on both front and *rear*, audible for 200 feet in back of the vehicle. No person, according to statute, shall start or back a vehicle on highway unless and until the movement can be made "with reasonable safety." Such considerations are not pertinent in this case, claimed defendant driver and owner, because the safety order is applicable only in connection with work on buildings or other "structures," and only to trucks hauling certain materials not fully defined.

Reversing a trial court judgment in favor of defendants, the Supreme Court saw "no merit" in these objections and granted a new trial. The higher tribunal's decision brings out certain practical points: (1) the repair and resurfacing of a highway is work on a "structure;" (2) asphalt paving mixture is a "construction material;" (3) horn must be sounded while vehicle is backing up.

Armenta et al. vs. Churchill et al., L. A. 22902, Supreme Court of California, 267 P. 2nd 303.

VIEWS AND COMMENTS

By H. G. Nevitt

More Bituminous Stabilization Needed

LAST month we expressed the view that the full traffic capacity of some types of bituminous structures was not indicated by most present design methods. The various design techniques may correlate reasonably well with field results within certain limits; the range of this good conformity, and the accuracy of the method within it, are probably somewhat different. And we further believe, as a consequence, that the bituminous stabilization of certain soils — usually those considered borderline for such treatment — has been unduly held back by failure to use design approaches which indicate the traffic carrying capacity of structures so obtained. If we are correct, the penalties resulting are considerable, and practical action to avoid them is indicated.

The least tangible (but in some areas the most serious) penalty comes from using up limited aggregate supplies. We must have good aggregate at a reasonable cost for our growing yardage of pavement proper. Even though this demand for new construction should cease we must periodically renew the traffic surface by seal coats. Where possible, aggregate supplies must be conserved for these purposes by stabilizing the local soil. At the same construction cost for alternate possible types this means marked future economies, for the aggregate saved will be worth far more later than the present cost of obtaining it.

• Lower direct construction costs obviously make soil stabilization mandatory provided effective results can be obtained. These savings are simply more evident if the aggregate value for other uses is included with the cost of using it in lieu of stabilizing the soil. The usual reasons given for not making such savings are that the treatment is not permanent, that a stabilized soil layer of normal thickness does not have the required traffic carrying capacity, or that stabilization manipulation costs are too high.

Permanent stabilization seems difficult to achieve with some soils. However, these soils almost always yield to experimentation, varying the bitumen quantity, type, and perhaps the addition of other agents. Construction costs are often a problem. In our view there is a great tendency to overmanipulation. The proper type of bitumen seems to achieve dispersion with only moderate mixing. Limitations due to soil type do exist — at least under present knowledge — but all these factors are over-used as excuses not to resort to bituminous stabilization.

Structure strength is another matter. There have been abuses on this point in both directions. In the early days of arbitrary design, bases were built in which a four inch stabilized layer was substituted for twelve inches of gravel, with unfortunate results — though these were often better than could have been expected. Likewise, mats were built in which plastic deformation — as distinguished from consolidation — occurred under loads of traffic magnitude. On the other hand, effective mats showing high cohesion could have been built which would carry the load under a suitable surface, but were rejected because they failed to meet the arbitrary requirements of laboratory tests which subjected them to stresses and/or strains which would not be encountered in their actual field use.

• Whatever the cause, stabilized bases in many instances could have economically replaced the conventional types, conserving highway funds and increasing the mileage of new construction. If the continuation of this situation can be avoided, it is the highway engineer's duty to do it. Action to this end, both immediate and long range, is indicated. The technical problem is serious. It will not be solved quickly even if the experts should come into agreement with our view, that a fresh start based on an analysis of fundamentals rather than refinements to present empirical methods is the next step. Highway administrators can demand a solution, but it will require time. Can they take any beneficial action in the interim period? We believe they can, and very effectively. Our thinking follows.

The immediate action should be the construction of experimental bases of the type discussed. Where serious doubts exist that the method is at all suitable, short trial sections can be built. But projects of normal size are usually better, and rarely involve a serious risk if judicious decisions are made following laboratory studies. These should experiment with more than one approach. And, in the final analysis, plate bearing tests on a small treated area give more reliable information than any indirect laboratory test.

The reluctance shown in some quarters to try soil stabilization, or to extend successful methods to new type soils, is really surprising. If a treated base (protected by a cheap surface treatment) shows up well under traffic after a reasonable time for curing and compaction, there has usually been an appreciable saving. If, however, the results point toward the need for more distribution of the load through a thicker surfacing, this can easily be added before any serious trouble has developed. Usually the addition can be a conventional bituminous mat, but an added granular foundation layer of minimum thickness under the final surfacing is also possible. And the total investment after these added costs will usually be no more than that using the conventional approach.

The overall results of an experimental program so conducted, testing out all soil possibilities, will ordinarily be less than staying with the usual construction, but there will be a tremendous profit from it in the form of knowledge that will lead to further savings from then on.

• The "gold in them thar hills" never equalled the wealth being taken out of the soil between them. In like fashion the key to highway savings — perhaps the only hope for an adequate road system in some areas — is making use of the soil on or near the right-of-way. But this will never come from closed minds, an attitude of waiting until the technique has been fully developed, or similar. Pioneering, bold experimentation, a demand for results now are the requirements.

Fortunately these are more likely to produce invaluable results at less risk than is the case in any other branch of engineering. Highway executives should welcome the unparalleled opportunities before them.

New chemical tested as soil stabilizer

A SOIL treating chemical said to hold promise as a subgrade soil stabilizer is under test in Indiana.

The chemical is a quaternary ammonium salt (dioctadecyl dimethyl ammonium chloride) made from tallow, according to a joint announcement by the Union Starch and Refining Company, the Indiana Highway Commission and the Chemical Division of Armour and Company.

Dioctadecyl dimethyl ammonium chloride, sold under the (registered) trade name Arquad 2HT, has been found to impart considerable hydraulic stability to many different soil types. In addition to the virtual lack of capillarity demonstrated by soils thus treated, the compressive strength shown is outstanding.

After laboratory study, it was felt results justified evaluation of Arquad 2HT. The Indiana highway commission selected two sites on new sections of highways being reconstructed.

The first site is on Route 42, 2½ miles southwest of Cloverdale, Indiana. The subgrade in this area has a high clay content and is classified as "B" and "C" Horizon type. The test strip is 400 ft. long and 22 ft. wide. The quaternary was added to the raw soil to a depth of 6 in. and the area was surfaced with 1 in. of asphaltic mix. A control strip was also built with 5 in. of stone aggregate topped by 1 in. of a bituminous mixture.

Two test strips were constructed at the second site, Route 243, south of Putnamville, Indiana. The soil here is predominantly silt with a low degree of cohesion, classified as "A" Horizon. The first strip of 250 ft. was treated with Arquad 2HT to 6 in. depth. The other was treated to 3 in. depth and topped with 2 in. of aggregate. In addition, a control strip having 1 in. bituminous carpet was laid on raw soil.

For all test strips and controls at both sites it was felt that the 1 in. bituminous surface was sufficient to seal and to prevent traffic abrasion without contributing to structural strength. As the tests were set up to evaluate the relative strengths of the subgrade material in test and control sections, the minimum surfacing was felt to be most desirable.

The use of trace amounts of Arquad 2HT materially improved the wetting properties of the compaction water and allowed for uniform wetting of the soil which included up to 2-in. clay clods. A section of treated, unsurfaced soil, exposed to normal weather and traffic conditions during September, October, and November of 1955, has demonstrated a high degree of resistance to surface water and abrasion, according to the chemical manufacturers.

"The cost of using trace additives as soil stabilizers," this source claims, "clearly indicates an economic advantage over conventional methods of stabilization. On the basis of currently calculated optimum concentrations of Arquad 2HT," the suppliers further claim, "the materials cost of stabilizing a mile of subgrade would be approximately 1/5 of present costs. While this is itself a very significant savings over conventional techniques, further economies are anticipated in labor and machinery utilization because of simplicity of application of the quaternary. Furthermore, suitable aggregate is becoming scarce in many localities and it is costly to ship. Use of Arquad 2HT may eliminate much or all of this need."

The Arquad is reportedly readily dispersable in water; merely added to the compaction water in a standard distributor equipped with spray bars. The soil is pulverized to 6 in. depth and the dispersion sprayed on, one part Arquad to 1000 parts dry weight of soil. After spraying, the treated soil is repulverized in place to insure uniform distribution of the additive.

"The unusual characteristics imparted to soils by Arquad 2HT suggests many potential uses," said an Armour spokesman, who foresees its use in such projects as backfill in house construction, reduction of the capillarity of farm ponds and irrigation ditches, flocculation of waters, and "waterproofing" of farm yards, highway shoulders and tennis courts.

Virginia road committee offers policy outline

A unique combination of suggestions is embodied in the recommendations of the Better Roads Committee of the Virginia State Chamber of Commerce, following a year-long study by that body.

While dodging recommendations for an increase in the gas tax, it presented 17 suggestions based on research by Dr. Rudyard Goode, formerly of the University of Virginia staff. The report was sent to the governor and the highway commission as an aid toward considering future legislation. Some of the recommendations:

- Highway studies should be kept on a current basis.
- Cities and towns (3,500 up) should develop plans for urban highways in cooperation with the department of highways.
- Acquisition of right-of-way should be carried out as soon as routes are planned.
- The General Assembly should halt all diversion of highway funds.
- Testing of petroleum products should be discontinued to save cost.
- Changes in the law is needed to permit greater use of funds for primary construction.
- Emphasis should be placed on rapid development of the primary system.
- Criteria for secondary highway fund distribution be changed from non-hard surface roads to hard-surfaced carrying over 100 vehicles a day.
- Modification of standards for the Interstate System should be sought to permit the development of projects in keeping with current needs.
- A revolving fund for advance purchase of right-of-ways should be established.
- State highway officials should establish right-of-way widths and laws be passed accordingly.
- Engineers should continue to design highway projects with safety as a prime factor.

It's Etnyre for even distribution at Douglas Oil Company of California

Douglas Oil Co. of California, located in Paramount, operates the front engine drive Etnyre "Black-Topper" shown above. The distributor is aluminum-jacketed, with stainless steel rear head.

The entire organization is "high" on the "Black-Topper." A. H. Peterson, Douglas driver, says: "Our Etnyre gives us positive control, even distribution, and smooth operation."

Woody Green, operator of the distributor, chimes in with "It takes a good machine and experience for tack coating, and our Etnyre does a real job."

The clincher comes from V. R. Marichal, Assistant General Manager, who writes: " . . . it has always given entire satisfaction on our jobs and to other operators that we know who use them."

You, too, can have the distributor which has no equal for accuracy, dependability, and long-life economy. Instead of putting up with second best, get in touch with your nearby Etnyre Dealer or write E. D. Etnyre & Co., Oregon, Illinois, U.S.A.

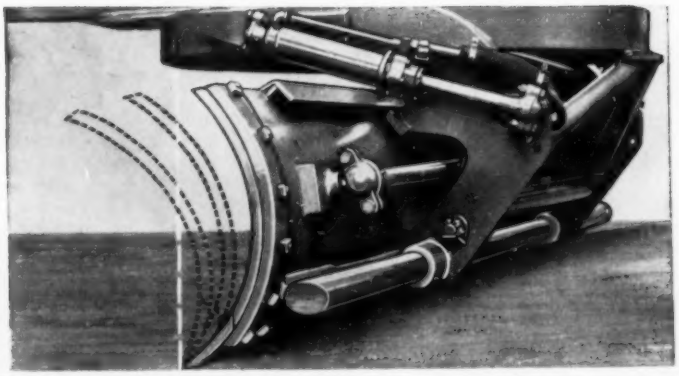
SEE YOUR ETNYRE DEALER

ETNYRE

"Black-Topper"

BITUMINOUS DISTRIBUTORS

. . . for more details circle 209, page 16



Hydra-Tilt Moldboard for Motor Graders

A hydra-tilt moldboard, announced by the Galion Iron Works & Mfg. Co., Galion, O., permits the grader operator to adjust the tilt of the moldboard without leaving the grader. A touch of a hydraulic control lever on the operator's platform is all that is necessary to instantly set the moldboard pitch at any point between minimum and maximum. The moldboard will be firmly held in the desired position until changed — no creeping.

This attachment works equally well with regular or hydraulically shiftable moldboards. Two hydraulic cylinders are supplied, one for attachment on each side of the circle. For complete information, write The Galion Iron Works & Mfg. Co., Galion, O.

For more information circle 122 on Service Coupon Page 16 and mail now.

Four New "Quick-Way" Models Truck Shovels

An all new "Quick-Way" for 1956, comprising four new models of truck shovels and five new carriers, has been announced by "Quick-Way" Truck Shovel Co., Denver, Colo.

A keynote of the engineering features of all "Quick-Way" models includes (1) Power up and down boom standard equipment on all models (2) Anti-friction bearings on all high-speed, continuous rotating shafts (3) All chain and sprocket drive (4) Heat hardened hook rollers and roller path (5) Air cooled clutch and brake drums (6) Smooth, positive hydraulic system and clutch controls (7) Advanced design lubrication

New "Quick-Way" Model 100, Mounted on New "Quick-Way" Carrier

with force-feed filtered circulation and daily grease fittings centrally located on cab (8) Hinged, fold-out panels all around for easy adjustment and maintenance and (9) Comfortable, ventilated, full vision cab.

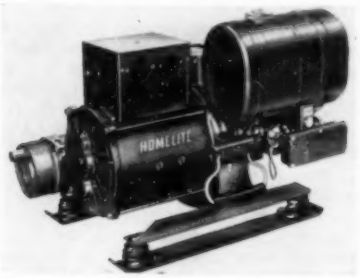
The new "Quick-Way" models include a 5-ton, ¼-yd.; an 8-ton, ⅜ yd.; a 10-ton, ½ yd.; and a 12½-ton, heavy duty ½ yd. — all fully convertible with the line of "Quick-Way" attachments.

To meet the needs of its customers, "Quick-Way" now offers 5 new carriers — designed with heavy duty specifications and specific capacities for all the new "Quick-Way" units.

For more information circle 123 on Service Coupon Page 16 and mail now.

1500 Watt Generator Weighs 90 lb.

Small size, light weight, close voltage regulation and generous overload capacity are among the features claimed for the new 1500 watt generator of Homelite, Port Chester, N.Y. The new 35A115 is a 115 volt, 60-cycle AC generator, developed for use by contractors, builders, utilities, construction men and municipal departments. It will operate all types of portable electrical tools and provide standby power in emergencies.



Homelite 35A115 Generator

Easily carried by one man, the new 35A115 weighs 90 lb., yet delivers 1500 watts of dependable power. It can quickly be set up in any location — no need for long, power-robbing cables. Equipped with four conveniently located outlets, the 35A115 can operate several tools simultaneously.

For more information circle 124 on Service Coupon Page 16 and mail now.

Utility Hammer Features "Stop Rotation"

A newly developed air-operated, all-purpose utility hammer, Thor Model No. 15, featuring "stop rotation" for alternate use as a rock drill or as a cement chipping hammer has been announced by Thor Power Tool Co., Aurora, Ill.

The exclusive "stop rotation" feature was developed because of strong demand from technicians for this type of tool. A simple external cam lever control permits instantaneous change from rotative to straight hammering action. Automatic rotation action is called on for drilling in stone and concrete and the tool is converted to straight hammering action for starting holes, chipping, light clay digging and demolition work.

Model 15 Utility Hammer
Weighs 15 lb. and is 17½ in. long.

The tools will be furnished in two versions — 15D and 15W — with the former for use as a dry tool and the latter as a wet tool to meet the problem of dust control.

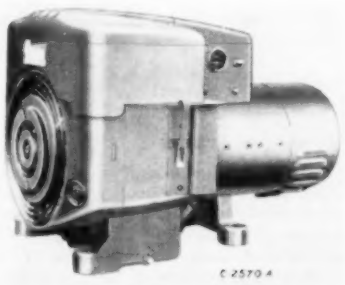
For more information circle 125 on Service Coupon Page 16 and mail now.

Air-Cooled Electric Plants

Two new electric generating plants, in 3500 and 5000-watt A. C. sizes, have been announced by D. W. Onan & Sons Inc., Minneapolis 14, Minn.

Models 305CCK and 5CCK are the two newest electric plant series in Onan's modern heavy-duty line of generating equipment. Both models are powered by a 2-cylinder gasoline engine, claimed to be the most compact in its horsepower range on the market today. For instance, the remote starting model, 305CCK, is 26⅜ in. long; (Model 5CCK is only 29⅞ in. long) width: 21⅛ in., and height: 20¾ in. is the same for both models.

Both of these two generating plant series are available in 60-or 50-cycle; 115, 230 or 115/230-volt, single phase, and 230-volt, 3-phase, 3-wire. There is a choice of standard remote control, portable or manual starting models. Fuel consumption for Model 305CCK is stated to be a low 0.19 gal. per kilowatt hour at full rated load!



Model 5CCK Electric Generating Plant

For more information circle 126 on Service Coupon Page 16 and mail now.

"Do it yourself" 17½ Ton Press

A special "Do It Yourself" 17½ ton press is being offered by Owatonna Tool Co., 434 Cedar St., Owatonna, Minn. All material including pins, bolts, spacers, ram holding plate, channels, and angles are pre-cut to size and shipped broken down. All you do is drill the prick punched holes, paint and assemble. You save the assembly cost.

The press design and materials are the same as found in the OTC power-twin standard press, number Y106-A.

The power head available on, but not part of the new "Do It Yourself" press, is an OTC power-twin hydraulic unit. It can be removed from the press and used with the various OTC pulling sets. The power unit with accessories will perform hundreds of pulling and installing jobs in garages, or maintenance shops.

"Do It Yourself"
OTC 17½ Ton Press

The press is 58 in. high, 23½ in. wide and requires a floor space of 28 in. x 27½ in. Width between the uprights is 20 in. and between table channels 5 in., distance between adjusting holes is 3⅜ in. Weight of the press is 180 lb.

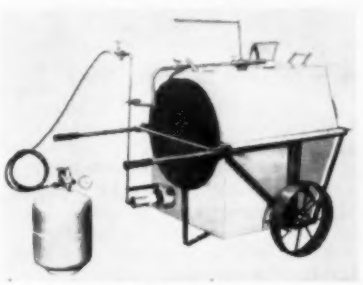
For more information circle 127 on Service Coupon Page 16 and mail now.

Barrel Heater for Bituminous Liquids

A new moderately priced portable barrel heater, specifically designed to allow on-the-job warming of liquid material in the original shipping drum has been announced by Tarrant Manufacturing Co., 27 Jumel Place, Saratoga Springs, N.Y. Especially adaptable to heating bituminous liquids.

Ruggedly built and designed to be fired by either bottled gas or kerosene, the Tarco Heater weighs only 200 lb. and can be loaded and operated by one man.

A controlled flame and specially designed heat diverting baffles apply heat evenly to the entire surface of either side or end bung barrels, thus eliminating over-heating and the hazard of flash fires. Side and end bung agitators assure proper venting before heat can be applied and a convenient temperature indicator tells the operator when liquids are hot enough for use.



Tarco Heater

For more information circle 128 on Service Coupon Page 16 and mail now.

Manufacturers' Literature

Hydraulic Truck Loader

A publication on its Lodal truck loaders, issued by Lodal, Inc., Norway, Mich., shows a few operations where man-equipment hours may be saved with Lodal. This multi-purpose hydraulic truck loader, 3,000 lb., capacity — loads one truck or many. Fully illustrated with specifications and exclusive features.

For more information circle 129 on Service Coupon Page 16 and mail now.

Soil Sampling Kit

A bulletin (No. 26) is available from Acker Drill Co., Inc., 725 W. Lackawanna Ave., Scranton, Pa., covering its soil sampling kit. This is a collection of 12 different earth and soil sampling tools in a handy steel box, small enough to be carried in any automobile. The tools have many uses, including foundation test borings, airfield runways, subgrade testing for highways, soil density for bearing data, and moisture content previous to soil compaction. The tools are illustrated and described.

For more information circle 130 on Service Coupon Page 16 and mail now.

All-Purpose Hole Digger

The new Acker "AP" digger is illustrated and described in Bulletin, No. 40, available from Acker Drill Co., Inc., 725 W. Lackawanna Ave., Scranton, Pa. Applications of the unit are shown, among them being soil sampling, driving pipe, digging post holes for guard rail and blast hole drilling. Illustrations and brief descriptions of the features of the unit are given. The digger has new and exclusive patented features making it a compact light weight unit. With a standard spiral auger head, it can bore holes up to 20 in. in diameter and to depths of 10 ft. By using sectional continuous flight augers, depths up to 75 ft. can be reached. A special pavement test core attachment for cutting reinforced concrete is available.

For more information circle 131 on Service Coupon Page 16 and mail now.

How to Save Drafting Time

A new booklet called "11 Ways to Save Drafting Time" is now available without charge to engineers and draftsmen. Published by Frederick Post Co., it is stated to be the first booklet that compiles the many ways of using intermediates to make quick modifications of drawings without changing the original. The booklet discusses 11 specific ways to use intermediates, with each of the time-saving techniques clearly illustrated. Brief copy takes the reader through every step of the process. Among topics covered are scissor editing, masking, the block-out method, successive additions and pre-printing. Other methods shown are transparent matte tape, pick-off transfer, composite grouping, composite overlays, non-reproducible blue and the use of corrector fluids. The techniques described apply to various print-making methods such as moist-developed process, ammonia process, blueprint, sepia negative and even reproduction cloths in some instances. Copies are available from the Reader Service Division of the Frederick Post Co., 3666 N. Avondale Ave., Chicago 18, Ill.

For more information circle 132 on Service Coupon Page 16 and mail now.

Do's and Don'ts of Blasting

A new, revised list of instructions and warnings on the proper handling and use of explosives and blasting supplies has been recently approved by the Institute of Explosives Makers. The 2-color, 4-page bulletin lists 72 "Do's and Don'ts" to be observed while transporting, storing, handling, loading or tamping explosives when shooting either electrically or with cap and fuse. Warnings applying to under-ground work, actions to be taken after firing and explosives disposal are included, as are eleven suggestions for minimizing poisonous gas hazards arising from blasting operations. Approved methods for priming an explosive cartridge with both cap and fuse and with electric blasting caps are described and illustrated. Single copies may be obtained without charge from Technical Division, Atlas Powder Co., Wilmington 99, Del.

For more information circle 133 on Service Coupon Page 16 and mail now.

Six-Wheel Trucks

Full information on International six-wheel trucks — both conventional and cab-over-engine models — is contained in a new 24-page catalog (form CR-860-E) made available by the motor truck division of International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Full color and two color treatment is employed throughout the book to present design and operating features of the line, which includes S-line, R-line, and CO models, powered by gasoline, diesel, or LPG engines. International six-wheelers, manufactured at Fort Wayne, Ind. as straight trucks or as tractor-trucks, range in gross vehicle weight ratings from 22,000 to 60,000 lbs., and in gross combination weight ratings from 35,000 to 65,000 lb. Other models, in the "400" series built at Emeryville, Calif., range up to 90,000 lb. GVW.

For more information circle 134 on Service Coupon Page 16 and mail now.

Hose Couplings and Nipples

A comprehensive 4-page bulletin in color has been announced by the LE-Hi Division of Hose Accessories Co., 2700 North 17th St., Philadelphia 32, Pa. Profusely illustrated, Bulletin No. 105 contains complete information on the wide variety of steel, malleable iron and brass hose couplings and nipples for industrial rubber hose in suction, water and petroleum applications.

For more information circle 135 on Service Coupon Page 16 and mail now.

Wire Rope in Drilling Operations

A comprehensive 60-page handbook on the selection, use, and care of wire rope in drilling operations has been prepared by Jones & Laughlin Steel Corporation. The handbook is titled "Wire Lines for Drillers." It covers wire rope applications in oil, gas and water well drilling operations. Sections are devoted to: Using and Maintaining J&L Wire Rope; Wire Ropes for Rotary Drilling; Wire Ropes for Cable Tool Drilling; Wire Lines for Production; Tables of Strength — Oil Country Wire Lines. The handbook is pocket-sized for ready reference. It has numerous drawings comparing the right and wrong ways of using and maintaining J&L wire rope. Also included are diagrammatic drawings of the various types of wire ropes. Copies of the handbook are available by writing: Wire Rope Products Division, Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

For more information circle 136 on Service Coupon Page 16 and mail now.

Splicing and Fitting Wire Rope

A new, 32-page illustrated brochure, issued by E. H. Edwards Co., Butler Road and Industrial Way, South San Francisco, Calif., gives detailed information on splicing and fitting wire rope, including sections on making a tuck, breaking down a strand, marine eye splice, blocking and serving, loggers eye splice, rolled-in eye splice, and endless splice. Also included are sections on eight strand ropes, variants and lengths of ropes, grommets, attaching a socket, socketing a ferrule, brazing and tapering, cutting, seizing, clips, thimbles, and end fittings. Step by step photographs and drawings illustrate correct methods of splicing and fitting.

For more information circle 137 on Service Coupon Page 16 and mail now.

Treated Timber Piles

"Pressure Treated Timber Foundation Piles," a new authoritative book of engineering information, has been published by the American Wood Preservers Institute. Comprehensive and well illustrated, it is available free to engineers, architects, and builders interested in foundations for heavy buildings, bridges, grain elevators, seawalls, viaducts, and overpasses. Filled with documented case histories, this treatise includes (1) pile driving formulae; (2) means for determining safe loads; (3) methods of solving problems of uplift and lateral forces; and (4) protective devices for use during driving. Other sections present: (5) excerpts from principal basic building codes; (6) specifications of the American Society for Testing Materials for use in

selecting timber piles; (7) standards of the American Wood Preservers Association for preservative treatment; and (8) test pile driving and test loading. For single copies address requests on company letterhead to the American Wood Preservers' Institute, 111 W. Washington St., Chicago 2, Ill.

For more information circle 138 on Service Coupon Page 16 and mail now.

Gravel Road Maintenance

An illustrated folder describing how to maintain gravel roads with a "once-over lightly" pass has been issued by Shunk Manufacturing Co., Bucyrus, O. A new type blade which is available for any type road maintainer, motor grader or terracer digs right in, thoroughly removes ruts and holes and leaves a cushion of loose material 1½ in. deep or more over the entire road surface which tends to compact smoothly under normal traffic. The new blades are stated to require less power, to last longer and to extend equipment life.

For more information circle 139 on Service Coupon Page 16 and mail now.

Portable Rock Drilling Equipment

Complete information regarding the advantages and uses of the gasoline engine or electrically driven Pinazza rock drilling and demolition equipment is included in the new literature published by Pitnam Industrial Products Co., 608 Fifth Ave., New York 20, N.Y. In addition to outlining the characteristics and uses for the three different models of hammers and the six different gasoline engine and electric motor drives available, the literature explains the patented "Centripowered Ram" principle which prevents overloading and permits drilling to depths of 16½ ft. with this compact unit. There are also data regarding operating efficiency, operating costs, etc., in comparison with comparable pneumatic equipment.

For more information circle 140 on Service Coupon Page 16 and mail now.

Concrete Mixer.

A catalog describing the Model 6-S Dandie concrete mixer has been released by Kwik-Mix Co., Port Washington, Wis., a subsidiary of the Koehring Co., Milwaukee, Wis. The catalog explains the many construction features of the one-bag capacity Model 6-S Dandie. It is designed for durable, lightweight strength that provides easy trailing and hand movement on the job. An exclusive combination of blades and buckets gives a more thorough remixing action to the mixer. Added operating features incorporated in the 6-S include an automatic syphon type water tank, flowline discharge chute, silent multiple V-belt drive and a selective skip shaker to speed drum charging. The mixer can be powered either by a 10 or 16 hp. gasoline engine.

For more information circle 141 on Service Coupon Page 16 and mail now.

Directory of Wood Treating Plants

Complete manufacturing facilities of 19 pressure-treating plants located in the western states are described for the first time in a directory, released by the Western Wood Preserving Operators' Association, 1410 S.W. Morrison St., Portland 5, Ore., to assist users and purchasers of chemically-alloyed forest products. Types of preservative and fire-retardant treatments available at each plant, fabricating equipment, kiln drying and maximum length of poles and piling treated are among points covered. Plant and sales office locations are listed.

For more information circle 142 on Service Coupon Page 16 and mail now.

Drilling Tools and Supplies

A new 40-page catalog issued by Acker Drill Co., Inc., Scranton 3, Pa., contains a complete and up to date listing of drilling tools and supplies used in soil sampling and drilling to moderate depths. The catalog, which contains 152 illustrations, is divided into seven sections: (1) Drill bits and core barrels; (2) Drill rods and rod handling accessories; (3) Flush coupled casing, drive pipe and associated tools; (4) Soil sampling equipment; (5) Shot drilling tools and accessories; (6) Auger tools; and (7) Miscellaneous drill supplies.

For more information circle 143 on Service Coupon Page 16 and mail now.

Crane-Excavator

A new 4-page, illustrated bulletin, (No. CR-501) describing the new self-propelled Model CR-35 Bantam, has been announced by the Schield Bantam Co., Waverly, Ia. The new bulletin contains detailed information concerning specifications, features, operating data and capacities of the company's new ⅜ cu. yd. 6-ton self-propelled crane-excavator. Features of the new Bantam model such as one-man operation, two-speed independent travel, a unique no-shift forward-reverse travel design, and 19½ ft. outside turning radius are illustrated and described fully in the new bulletin. One full page is devoted to complete machine specifications and capacity ratings. Large charts show lifting capacities and digging ranges for crane, shovel, and back hoe attachments.

For more information circle 144 on Service Coupon Page 16 and mail now.

Heavy Duty Tandem Rollers

Bulletin S-70-1155, covering all heavy-duty 2-axle variable weight tandem rollers, has been released by the Buffalo-Springfield, Springfield, Ohio. Liberally illustrated, this 12-page bulletin describes outstanding performance features and covers construction details on the 5-8 ton Model KT-16D, the 6-9 ton Model KT-17D, the 8-14 ton Model KT-24 and the 10-16 ton Model KT-25D. Among the outstanding performance features are Buffalo-Springfield's new power roll brakes — and tapered roller bearings on all rolls. Major component parts of the four Heavy-Duty 2-Axle Tandems, including currently available accessories, are fully described. A handy table, giving comparative dimension, specification, weight and compression data on the four models, is included to assist in making a quick selection of the proper model for the work to be accomplished.

For more information circle 145 on Service Coupon Page 16 and mail now.

Turbochargers for Smaller Diesels

A 16-page brochure illustrating and describing its line of turbochargers for industrial applications has been issued by Air Research Industrial Division, of The Garrett Corporation, Los Angeles 45, Calif. The applicability of these turbochargers covers a broad range and includes earthmoving equipment, diesel trucks, and busses, locomotives, stationary power plants, pumping stations and wherever ground operational engines are used. Experimental models accumulated over 30,000 hours of satisfactory use in earthmoving equipment and stationary installations in less than one year. One early Air Research turbocharger accumulated 6,000 hours of trouble-free operation, equivalent to 750 working days, within an 11-month period without requiring any servicing or maintenance.

For more information circle 146 on Service Coupon Page 16 and mail now.

Bucyrus-Erie Excavator-Crane

A new bulletin (15-B-4) describing the Bucyrus-Erie 15-B excavator-crane is available from Bucyrus-Erie Co., South Milwaukee, Wis. Generously illustrated with on-the-job photographs and close-ups of mechanical features, the 40-page booklet includes complete specifications and working ranges. The 15-B is a ½-yd. shovel which is readily convertible to dragline, clamshell, dragshovel or lifting crane for handling a wide range of excavating and lifting jobs. It is offered with gasoline engine, diesel engine, or electric motor. Other basic features described are: directly hand-set clutches, all-welded revolving frame; crawler mountings; strong, light-weight shovel frontend; positive twin rope crowd system; fully independent boom hoist; four-way safety control of boom lowering; and full-rotating dragline fairlead.

For more information circle 147 on Service Coupon Page 16 and mail now.

Skid-Shovels

Information describing the exclusive Hydro-Spring feature of the International Drott skid shovel, is contained in a new 4-page bulletin (Form CR-403-5), available from International Harvester Co., Consumer Relations Department, 180 North Michigan Ave., Chicago 1, Ill.

The Hydro-Spring feature, which acts as a shock cushion, is offered in four skid-shovel sizes ranging from 1 to 3 cu. yd. using International crawler tractors from the small TD-6 up to the TD-18 size.

For more information circle 148 on Service Coupon Page 16 and mail now.

4-Wheel Drive Units for Trucks

New literature released by Napco Products Division of Napco Industries, Inc., Minneapolis 11, Minn., includes 4-page pamphlets describing Napco's Powr-Pak 4-wheel drive units for use with GMC and Chevrolet trucks.

The two-color illustrated literature describes many various duties which trucks equipped with Powr-Pak can perform and also lists full specifications of the units.

For more information circle 149 on Service Coupon Page 16 and mail now.

Pump Maintenance Hints

Helpful hints on maintenance of initial pump efficiency and choosing a dredge pump that best fits a particular need are discussed in a new bulletin, describing the "GA" and "GAF" dredge pumps of Morris Machine Works, Baldwinsville, N.Y. The bulletin, No. 184-A, outlines the 24 models in this line which range from 6-in. to 20-in. size.

For more information circle 150 on Service Coupon Page 16 and mail now.

Indiana Toll Road Contractors use STANDARD *Lubricants and Fuels*

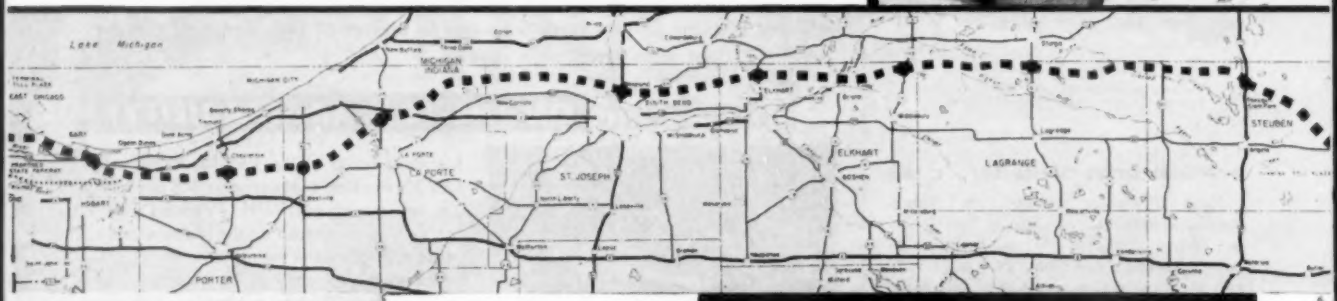
Prime contractors and sub contractors on the project choose STANDARD. Reason: (1) top quality (2) service

The Indiana Toll Road is the biggest construction project ever undertaken in the State of Indiana. All parts of the job are going at a high production rate. To maintain such a record, contractors must get top performance from equipment. STANOLUBE Motor Oils, STANDARD Diesel Fuels and STANDARD Gasolines help them get this kind of performance—with plenty to spare—from all types of equipment, under all operating conditions, in any weather.

To keep on schedule, supplies of lubricants and fuels have to be where needed at any hour, day and night, Standard Oil maintains stocks at the job site for every one of the contractors served. Equipment never waits for fuel or lubricants.

This is big construction. Small wonder that on this project from borrow pit and fill, from pile driver to batching plant, construction equipment uses STANDARD lubricants and fuels. Big job or small, let Standard be your supplier. In any of the 15 Midwest and Rocky Mountain states, Standard Oil automotive lubrication specialists are nearby and ready to help you. Call them or write Standard Oil Company, 910 So. Michigan Ave., Chicago 80, Ill.

Equipment Superintendent, Lewis A. "Shorty" Martin (left), and Standard automotive lubrication specialist O. H. "Grit" Collier discuss parts maintenance at Western Contracting Corporation field shop. Field technical service such as this is old stuff to Grit Collier. He has been doing such work for 10 of his 22 years at Standard Oil. Grit is a graduate of the Standard Oil Sales Engineering School. Customers find this experience and training pay off *for them.*



Indiana Toll Road traverses state from Hammond, Indiana to junction with Ohio Toll Road, a total of 153.3 miles of four lane highway. Scheduled completion date . . . Fall 1956.

Rieth-Riley Construction Co., a prime contractor, sets fast pace for equipment, cuts time out for lubrication maintenance by using lube truck.

Quick Facts About
STANOLUBE Motor Oils

1. **STANOLUBE Heavy Duty Motor Oils are refined from high quality base stock.**
2. **Additives exclusive with STANOLUBE Heavy Duty Motor Oils retard oxidation, reduce formation of piston and ring belt deposits.**
3. **These additives in STANOLUBE Motor Oils prevent fuel from forming varnish and sludge.**

Allis Chalmers HD 21 "push-loading" a Euclid scraper in borrow pit on Union Building and Construction Corporation job. Union is building 13.1 miles of Toll Road in Steuben and La Grange Counties and four miles in Lake County. They are one of the prime contractors served by Standard Oil.

STANDARD **STANDARD OIL COMPANY**
(Indiana)

. . . for more details circle 258, page 16

ARE YOUR AIR AND STEAM TOOLS PROPERLY LUBRICATED?

Be sure with a visible feed automatic line oiler. Can't clog or flood. No moving parts to wear out. Rugged welded construction meets A. S. M. E. requirements. ½ gal. oil capacity. Set it and forget it.

Increase Production as much as 30% over dry wheezy overheated tools. Can be used to mix antifreeze with air to prevent icing of tools in winter. Easily installed on receiver tank or air or steam line. Standard pipe thread fittings. Minimize repairs on all tools from a small tamper to the largest pile hammer or extractor.

Cash prices tax paid f.o.b. Freeport, Ill.

25% Discount on orders of 6 or more

Model	cu. ft. per min.	Price
#5	85 to 105	$38.00
#6	210 to 500	45.00
#7	600 to 900	65.00
#9	for use with steam-pipe size 2" 2½" or 3"	78.00

MURRAY EQUIPMENT CO.
1208 S. Chicago Ave.
FREEPORT, ILLINOIS

FOR SALE

ATTRACTIVE PRICES

1—Model K-12 Insley ½-yd. Shovel and Back Hoe with #271 GMC Diesel Motor.
1—Model L Insley ¾ yd. Shovel and Back Hoe with #315 Cat. Diesel Motor.
1—Model 25 Northwest ¾ yd. Back Hoe with #371 GMC Diesel Motor.
1—Model 160 Buckeye Trencher (2 sets of buckets) with Buda Gas Engine.
1—Model HMD 4 wheel drive 1½ yd. Hough Loader with Hercules Diesel Motor.
1—Model 201 Buckeye Trencher (Digs to 22 feet).
1—Model 212 Caterpillar Patrol.
1—Model TD-14 International Tractor and Dozer.
2—Model 30 Ferguson Tractors with loaders.
1—25-ton La Crosse Low Bed Trailer.
1—½-yd. Insley Drag Boom with Fairleads.
1—Dotmar Paver for Curb and Gutter (with two screeds).
3500 Lineal feet Curb, Gutter and Sidewalks Forms.
Various Centrifugal and Slush Pumps.
Various 1½ ton Flat Bed Trucks.

All above items are very attractively priced and may be seen in our yard in Alexandria, Minnesota.

HENRY NODLAND CO.
Alexandria - - - - - Minn.

FOR SALE

1—LETOURNEAU Turnadozer with Buda Diesel Power. Rebuilt $8,250.00
1—TROJAN Model L.M. 75 Hydraulic Loader $2,750.00
1—REX 3-yd. Moto Mixer $1,250.00

THE EARLE EQUIPMENT CO.
2424 - 28th St. S.E. CH. 59247
Grand Rapids, Mich.

TRUCK CRANES

Model 414 Lorain 20 ton truck crane. Serial #14822. Factory mounted carrier. 80' boom, 20' jib. Powered boom hoist.
Model 304 Koehring 20 ton truck crane. Serial #C-5726. Mounted on Available carrier. 30' boom. Powered by Waukesha Engines.
Model T-15-C Browning truck crane. 17½ ton capacity. Serial #3612. Mounted on Henderson tandem carrier.
Model 25 Northwest 20 ton truck crane. Serial #11537. Factory mounted tandem carrier. 35' boom. Powered by Buda and Waukesha engines.
Model TLCT Michigan truck crane. Serial #4729. 50' boom, 10' jib. Factory mounted tandem carrier. Powered by Hercules and Continental engines.

Excellent Condition, Priced Right

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Phone Elgin 6-4429

Roads and Streets' Clearing House REACHES THE MARKET'S HEART

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CITY, COUNTY ENGINEERS
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Long a leader serving the heavy construction and associated fields, ROADS AND STREETS' "cream" circulation goes to the important men in the business. They are the men, who directly or indirectly influence the purchase and sales of new and used equipment and supplies.

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Use the Clearing House!

Just clip the coupon below and attach your copy.

CLIP YOUR AD COPY TO THIS HANDY ORDER FORM AND MAIL TO

CLEARING HOUSE SECTION ADVERTISING RATES

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CONTRACT RATES — Based on use of total space indicated within yearly period.

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24 in.	10.35
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180 in.	9.25
360 in.	9.00

COPY AND CLOSING DATES Final closing date is the Fifteenth of the preceding month. Magazine is issued 1st of publication month. If proof is desired, copy must be received 5 days preceding closing date.

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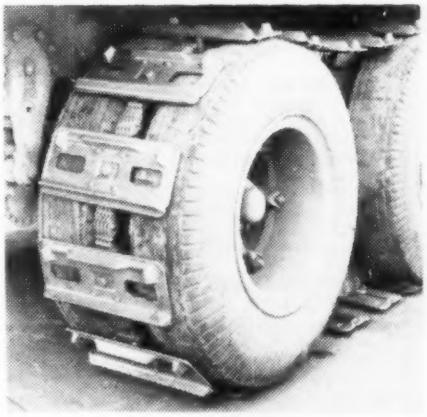
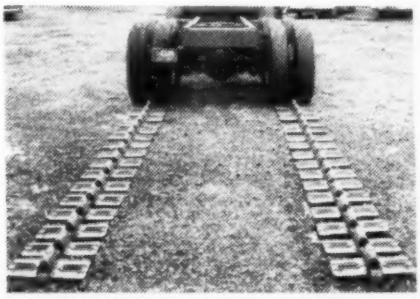
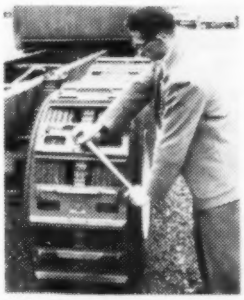
FULL 18" TIRE TRACKS
AT LESS THAN HALF THE REGULAR COST

Make every day a working day! Don't let mud, snow, sand stop your equipment! These tracks convert all dual tire equipment to crawler action in minutes, increasing surface contact by 500% . . . more than repay the low purchase price in extra working days!



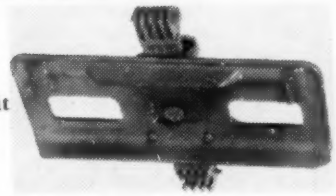
Eliminate Mat Handling or Towing Costs!





EASILY MOUNTED **ADJUSTABLE** for perfect fit

1. Lay tracks on ground.
2. Back on, feeding over tires.
3. Clamp two ends together.
4. Tighten adjusting bolts.



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7:50x20	$240.00	$408.00	$432.00	$432.00	$432.00	$456.00	$456.00	$456.00	$480.00
8:25x20	$264.00	$432.00	$432.00	$456.00	$456.00	$456.00	$456.00	$480.00	$480.00
9:00x20	$264.00	$432.00	$432.00	$456.00	$456.00	$480.00	$480.00	$480.00	$504.00
10:00x20	$264.00	$456.00	$456.00	$456.00	$480.00	$480.00	$480.00	$504.00	$504.00
11:00x20	$288.00	.....	$456.00	$480.00	$480.00	$480.00	$504.00	$504.00	$504.00
12:00x20	$288.00	.....	.....	.....	$480.00	$504.00	$504.00	$504.00	$528.00

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International ID-9 with hydraulic controlled loader.
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4—Austin-Western Motor Graders Model 99H, late model machines.

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28 ft. cabin cruiser, former coast guard boat, no motor.

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TERMS: Complete payment sale day; Cashier's Checks, Certified Checks.
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DODGES — 1½ and 2¾ Ton capacities.

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1¼ yd. Manitowoc 2000B Diesel Crane 1948.
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With the Manufacturers and Distributors

Adams grader operators to get certification

Certification of heavy construction equipment operators, which has been carried on for 15 years by LeTourneau-Westinghouse Company to cover Tournapulls and Tournatractors, has now been broadened to include operators of Adams Motor Graders, the Peoria manufacturer announces.

At the same time, LeTourneau-Westinghouse has enlarged its publication for equipment operators, mechanics and owners — *The Co-Operator* — to include the Adams line. The Peoria firm purchased the plant and assets of J. D. Adams Manufacturing Company of Indianapolis in January, 1955.

Certification of Adams Motor Grader operators marks another high point in a program inaugurated by the LeTourneau Company (now LeTourneau-Westinghouse) in 1939 as an aid to both operators and contractors. The 10,000th operator was certified in 1949, and the 15,000th in April, 1955.

The first Adams operator to be certified is Clarence Limp, LeTourneau-Westinghouse Service Engineer, who is chief demonstrator of Adams graders, and who headquarters at the Adams plant at Indianapolis. His Certified Operator number is A-16000.

LeTourneau-Westinghouse points out that regulations which have governed the program in the past still apply. To be eligible, an individual must have a record of capably operating LeTourneau-Westinghouse equipment (including Adams Motor Graders) for six or more months, which must be verified in writing by the applicant's contractor-employer (or a former one). Individuals certified as Tournapull, Tournatractor and Adams Motor Grader operators receive a belt buckle. Those certified to operate crawler-tractor-drawn LeTourneau-Westinghouse equipment receive a watch fob, engraved with the operator's name and certificate number, and carries the L-W trademark symbol.

Clarence Limp

NEW MARION DIVISONAL SALES MANAGERS. Marion Power Shovel Co., Marion, O., has appointed Lawrence E. Schaffer divisional sales manager in the company's sales area. His office is at 2245 Nottingham Road, Columbus 21, O. George L. Moritz has been appointed divisional sales manager in the company's eastern area, with office at 105 Spruce St., Emmaus, Pa.

NEW ESSCO SALES DISTRICT. Organization of the Central Sales District located in Danville, Ill., has been announced by Electric Steel Foundry Co., Portland, Ore. The new district will handle all sales of ESCO construction equipment, logging and sawmill equipment east of the Rockies and stainless and high alloy products, and cast specialties for the central states and areas of the south. Manager of the new Central Sales District is Tom P.

Kirby, who has been manager of the Gulf and Atlantic, and Midwest branches, now included in the new district.

TWO PROMOTIONS BY CHAIM BELT. Chaim Belt Co., Milwaukee, Wis., has announced the following promotions: W. B. Marshall, formerly sales promotion manager, has been appointed to the new position of manager market development and sales training. G. H. Pjeifer, formerly advertising manager, has been appointed to the new position of manager sales promotion and advertising.

NEW DETROIT DIESEL DISTRIBUTOR. Peninsular Diesel, Inc., has been appointed distributors for General Motors Industrial Diesel engines. The company will operate throughout Michigan's lower peninsula with headquarters at 6565 West Warren Ave., Detroit, Mich. A branch is to be established in Grand Rapids.

NEW CONTRACTORS EQUIPMENT COMPANY. Interstate Contractors Equipment Co., 2011 Glenarm Place, Denver, Colo., is a new distributing company organized by Rob't H. Reynolds, President. This company has been appointed as distributor for the "Earthripper," a new ditching and trenching machine, manufactured by Owen-Pewthers Manufacturing Co., College Station, Tex. The sales territory includes Colorado, Wyoming, Western Nebraska and Kansas, and local dealers will be appointed in some of these market areas. Other special lines of contractor equipment will be added.

MERCER APPOINTED GENERAL MANAGER. E. J. Mercer has been appointed general manager, Construction Machinery Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis. Mercer has been managing director of Allis-Chalmers Great Britain Limited with headquarters at Essendine, England. In that position he directed all operations of the company in Great Britain which served much of the world for the products manufactured by Allis-Chalmers in England.

CLYMER NEW AD MANAGER DETROIT DIESEL. D. J. Clymer has been appointed advertising Manager of Detroit Diesel Engine Division of General Motors, Detroit, Mich. Mr. Clymer joined Detroit Diesel's technical publications department in 1943. He was later in charge of distribution sales management programs and national trade shows and also assistant to the advertising manager.

NEW MARION DISTRIBUTORS. The following new distributors have been appointed by Marion Power Shovel Co., Marion, O., for its line of crawler and rubber mounted excavators from ¾ cu. yd. to 4 cu. yd.: Knight Equipment Co., 1760 Kelly Road, Richmond, Va., for central and western Virginia; Machinery Supplies and Equipment Co., 2000 Walnut St., Kansas City, Mo., for the state of Kansas and western third of the state of Missouri.

DAVEY APPOINTS KIDDY MANAGER. J. W. Kiddy has been appointed manager

. . . for more details circle 254, page 16

● Carl J. Heltzel, president, and Robert E. Heltzel, vice president of the Heltzel Steel Form and Iron Company, Warren, Ohio, look over plans for a new 27,000 square foot expansion to their Warren facilities for the manufacture of steel forms, batching plants and road machinery for the construction industry.

of the rotary drill and air tool division of Davey Compressor Co., Kent, O.

HARRY J. SEAMAN FORMS NEW FIRM. A new firm, to be known as Seaman Engineering and Research Corporation has been established by Harry J. Seaman, a leading authority and pioneer in soil stabilization as employed in highway and airport construction. According to Mr. Seaman, the new firm was established to pursue extensively the further study of soil stabilization and related mechanization. Mr. Seaman, as head of the new company, reports that he intends to devote his knowledge of soil mechanics to the design and development of new types of road building equipment. Mr. Seaman was the founder and sole owner of the well-known Seaman Motors, Inc., which he sold a year ago. Mr. Seaman was the inventor and manufacturer of the internationally known and used Seaman Pulvi-Mixer and Seaman rotary type soil tillers, as well as the Seaman marine type Uni-Flo gas engine, which constituted the original production of Seaman Motors. Seaman Engineering and Research Corporation will have its headquarters in Milwaukee, Wis., and all present operations will be under the direct supervision of Harry J. Seaman.

LOU DIERKS OF SAUERMAN RETIRES. Louis E. Dierks recently retired from active duty with Sauerman Bros., Inc., Bellwood, Ill., after 42 years with the company. He was a vice-president and a member of the board of directors. Lou's engineering ability coupled with his very practical nature contributed much to the development of Sauerman equipment. Mr. Dierks will remain with Sauerman Bros., Inc. as a consultant.

ROWLEY APPOINTED PURCHASING AGENT. W. F. Rowley has been appointed purchasing agent of the Construction Machinery Division of Clark Equipment Co., Benton Harbor, Mich. During the past 13 years Mr. Rowley has been assistant purchasing agent of Clark's Automotive and Industrial Truck Divisions.

CANADA JOINS FWD. Howard R. Canada, who has been assistant to the parts sales manager of General Motors' Electro-Motive Division, has been named director of parts and service for Four Wheel Drive Auto Co., Clintonville, Wis.

CHANDLER NAMED SERVICE MANAGER. K. R. Chandler has been appointed Service Manager for Koehring Co., Milwaukee, Wis. He succeeds G. N. Nelson whose retirement after 44 years of service with Koehring Co., effective on Dec. 31.

COLACUORI APPOINTED SALES SUPERVISOR. S. D. Colacuori has been appointed to the newly created position of sales supervisor, motor truck development, Motor Truck Division, International Harvester Co., Chicago, Ill. Colacuori, since 1948 general supervisor of motor truck sales engineering, has been succeeded in that assignment by N. L. Ginder, sales engineering consultant.

EASTON CAR ELECTS VICE PRESIDENT. George D. Fraunfelder, director of engineering and research, has been elected vice president-engineering, and U. M. (Ben) Johnson, project engineer, has been elected vice president-Industrial sales of Easton Car & Construction Co., Easton, Pa.

CARY SALES ENGINEER JOINS N. Y. OFFICE. Morris Machine Works, Baldwinsville, N. Y., has announced the association of J. C. Cary as a sales engineer with its representatives for the New York, northern New Jersey and Long Island area. Mr. Cary has been a sales engineer with home office for 2½ years.

GUARNIERE APPOINTED MERCHANDISING MANAGER. T. L. Guarniere has been apointed merchandising manager of the Detroit Diesel Engine Division of General Motors. Prior to his present appointment, Mr. Guarniere was sales promotion manager. In his new capacity he is in charge of the Division's advertising, sales promotion and publicity activities.

NEW MARLOW FIELD REPRESENTATIVE. Richard G. Bolling has been appointed district engineer in the Virginia — North Carolina area for Marlow Pumps Division of Bell & Gossett Co.

DOUGLASS APPOINTED THEW PARTS SALES MANAGER. Don L. Douglass has been appointed to the newly created position of parts sales manager of The Thew Shovel Co., Loraine, O.

NEW MARION SALES TEAM. Marion Power Shovel Co., Marion, O., has announced a strengthened sales organization in the southwestern states, headed by Dean Calland as western sales manager. His headquarters are at 326 Shaw Road in South San Francisco. Two divisional sales managers have been named to work with him in expanding sales and service in California, Nevada, Utah and Arizona. They are T. R. Fogelberg, 4835 Crenshaw Blvd., Los Angeles, and E. J. Riggs, located at the company's parts warehouse at 1017 North 22nd Ave., Phoenix, Ariz.

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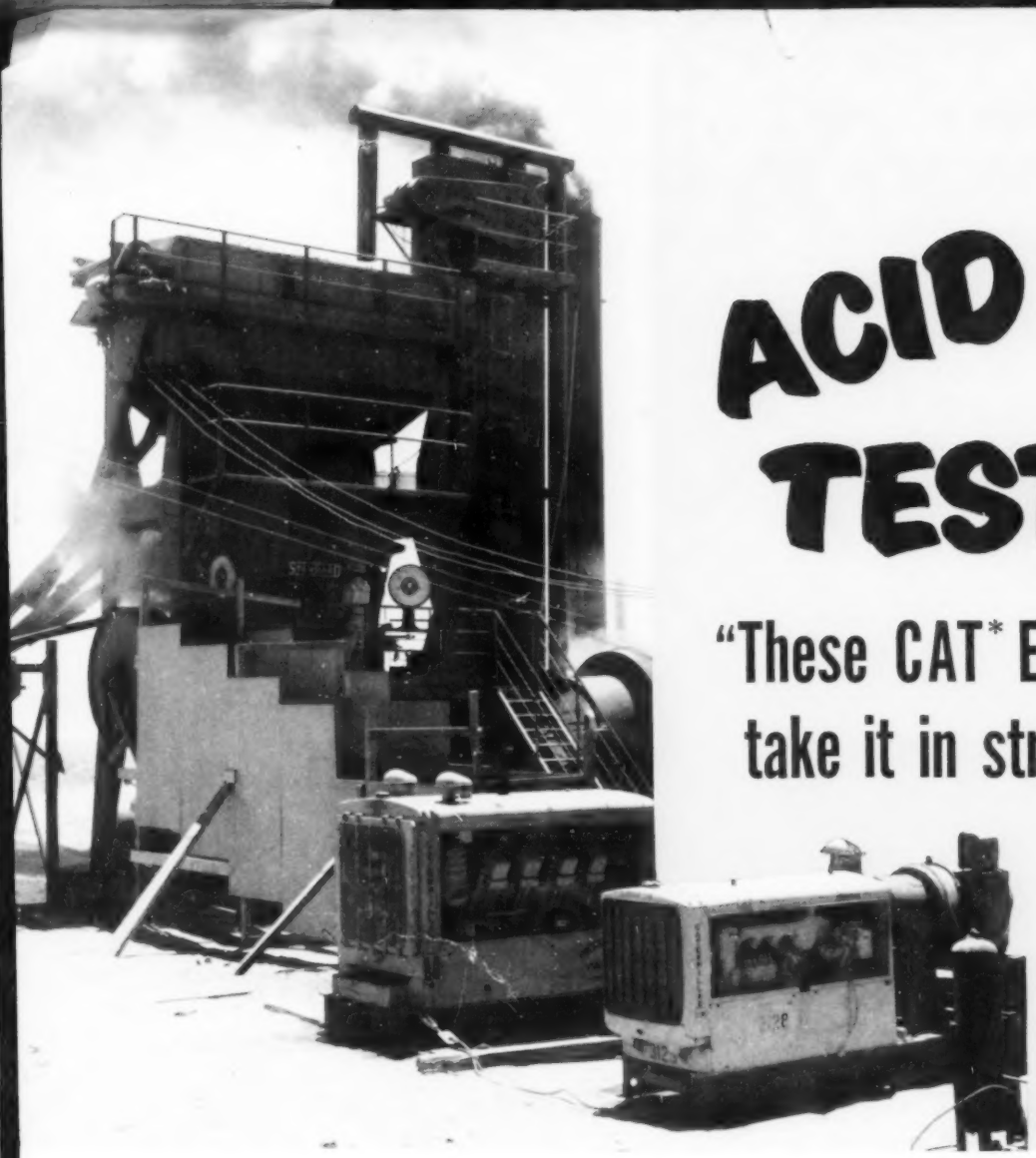

ACID TEST!

"These CAT* Engines take it in stride"

"If you want to give an engine the acid test," says Frank Muren, superintendent of this road job in the Mojave Desert, "put it in a hot plant like ours. There's heat and plenty of dust, but these Cat Engines take it in stride."

There are three Caterpillar D17000 Engines in this hot plant at Edwards Air Force Base, Calif., with more than 14,000 hours among them—and *no repairs*. One of them is shown here powering the dryer, together with a Cat D318 supplying auxiliary power. The contractors, Fredericksen and Kasler of Sacramento, Calif., have seven Caterpillar Engines on the job with a total of about 25,000 hours.

Cat Diesels owe their trouble-free work lives to such features as "Hi-Electro" hardened crankshaft journals, long-lasting aluminum alloy bearings, and highly *effective* filters and seals that keep lubricants *in* and harmful grit *out*.

It's *economical* work life, too. Every Cat Diesel is built to operate cleanly and efficiently even on low-cost fuels, such as No. 2 furnace oil. The rugged simplicity of these efficient power units means easy maintenance, minimum down time, low repair bills.

There's a Caterpillar Engine or Electric Set for *your* job requirements, to 520 HP and 315 KW. Your Caterpillar Dealer will gladly help you select the equipment that will do more work for you at lower cost. See him soon—you can count on him whenever you need fast, reliable service or original Cat parts.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

MODERN HEAVY-DUTY POWER

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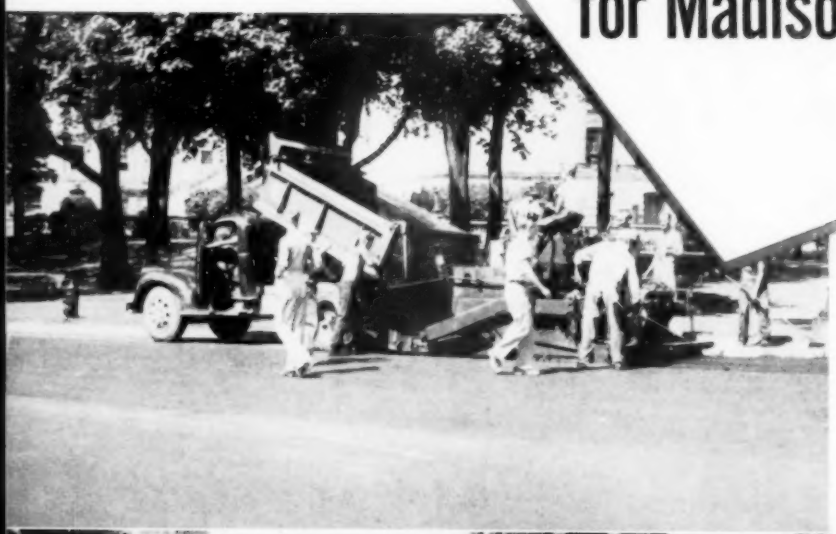
38 miles of this paving for Madison, Wisc. streets



The 3-inch Texaco Asphaltic Concrete pavement recently constructed on Carroll Street is typical of the Wisconsin capital's large mileage of this durable, skid-resistant paving.

Contractor . . Rein and Schultz
Texaco Asphalt supplied by Scotch Oil Company

The best indication of how a city rates a pavement is the mileage of that type constructed on the city's streets. Last year, Wisconsin's capital city paved six miles of its streets with resilent, heavy-duty Texaco Asphaltic Concrete. Approximately 38 miles of this durable, yet economical, paving has been laid in Madison over the past ten years.

Hot-mix Texaco Asphaltic Concrete has a number of advantages which make it an ideal pavement for city streets. Its resilent, flexible quality enables it to absorb heaviest traffic impact year after year with a minimum of upkeep. The speed with which it is laid and opened to traffic is appreciated by motorists and merchants alike. Its skid-resistant texture and the sharp visibility of white traffic lines against the dark pavement are important aids to safe driving. During the winter months, not only is Texaco Asphaltic Concrete immune to ice control salts, but its dark, heat-absorbing color causes snow and ice to melt more rapidly.

Helpful information on methods and materials recommended for Texaco Asphaltic Concrete, as well as all other types of asphalt construction for city streets, is presented in two free Texaco booklets. Municipal officials may obtain copies without obligation by writing our nearest office.

THE TEXAS COMPANY, Asphalt Sales Div., 135 E. 42nd Street, New York City 17
Boston 16 Chicago 4 Denver 1 Houston 1 Jacksonville 2 Minneapolis 3 Philadelphia 2 Richmond 19

TEXACO
REG. T. M.

TEXACO ASPHALT

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